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Abstract

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This research aimed to provide fresh perspectives and experiences in technology-based learning, in an endeavour to produce new knowledge that would further inform the literature on the utilisation of technology in education. The Case Study research (Merriam, 1988) attempted to develop an understanding of the change in pre-service teacher trainees' pedagogical practices in the integration of ICT in learning environments during a 12-week undergraduate course where synchronous networked tasks were developed and implemented. The contributions by the trainees (n=16) to the process of the iterative task design, post-task discussions, and commentaries on a Bulletin Board System, provided insights to the research question regarding changing beliefs and the impact of synchronous networking in affecting such change. This qualitative data was supported by quantitative data in the form of weekly surveys that situated synchronous and asynchronous task activities and cognitive outcomes (Knipe & Lee, 2002). In summary, the research highlighted a development of academic competencies (Morrison & Collins, 1996) considered appropriate for informed ICT integration; namely, generic, epistemic and declarative competencies. In addition, after taking into consideration the competencies developed during this Case Study, a framework consisting of four key elements, namely, the communication, the task, the learning and the technology, was drawn. It is thus anticipated that the competencies and the framework contribute new knowledge to the literature on technology in education on how best facilitate the 'informed' integration of ICT (Towndrow & Vallance, 2004) by teachers to support 'good' learning (Goodyear, 2001).

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Declaration

The author hereby declares that none of the material presented in this thesis has been previously submitted for a degree.

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This thesis would not have been possible without cooperation of the pre-service teacher trainees who participated in this Case Study. I would like to thank Dr. Phillip Towndrow for his friendship, collegiality, intriguing thoughts and probing questions. I am grateful to the staff at the University of Durham for their guidance, in particular my supervisor Stewart Martin and EdD coordinator Professor Mike Byram. I wish to acknowledge the Apple engineers for developing innovative, user-friendly technologies, especially those at Math Game House for iStorm. Finally, and most importantly, I wish to express thanks and love to my wife, Noriko, for the sacrifices made during the time it took to complete my Doctoral study.

CHAPTER 1 INTRODUCTION

1.1 Statement of the topic

Pre-service teachers who have grown up in a technology rich environment may be expected to enter the teaching profession well prepared to integrate technology into their future teaching (U.S Department of Education, 2000). However, although technical competency has increased amongst teacher training graduates, a lack of confidence in their ability to integrate Information Communications Technology (ICT) in teaching and learning mirrored that of their in-service colleagues (Schrum, Skeele, & Grant, 2002). In effect, while recent teacher graduates have increased ICT skills, they realise that they do not know how to effectively apply these skills to a desired pedagogy that facilitates a more student-centred strategy for learning. It is anticipated that this study will add value to the academic literature in the 'application of informed ICT utilisation' by pre-service teachers in preparation for their chosen profession.

1.2 Purpose of the study

In recent years, technology has played an important role in shaping educational policies to ensure a nation's political and economic success (Tan, 1998; OECD, 2001; Cuban, 2002). In market-driven, capitalist societies the policies of education can be considered as preparation of individuals for gainful employment. Karl Marx (1990) called this 'labour power' where workers sell their labour to receive wages. Current terminology refers to 'human capital' (Woodhall, 1997), which takes into account societal and global interests, as well as individual development. At the societal level, individuals are brought together to create 'learning societies' and associated 'desired outcomes of education' are framed by policy makers to mould a nation in specific ways. To facilitate human capital growth in the early years of the twenty first century (and initiated in the late 1990's), governments are investing in education systems to create 'technological capital' (Towndrow & Vallance, 2004). For instance, the Prime Minister of Singapore illustrates the expectation that technological capital provides when given prominence in a nation's strategic plan, "To sustain Singapore's prosperity will require even higher skills and better education. ... The process of imparting skills and knowledge begins in schools. ... Everyone with good technical skills and a willingness to keep on learning can find a challenging, satisfying and well-paid job" (Goh,1998; 7).

However, the investment in technological capital, which suggests that computer use in schools will result in increased income for individuals, remains uncertain. There is no doubt that technology is impacting upon the world of work (as it has done since the Industrial Revolution) but the contribution of schooling in preparing a technology-skilled workforce is "murky" (Cuban, 2002;178). If this is the case, then maybe the policies are deficient. For example, returning to the Singapore context (being the location of this research), the education policy may provide an agenda for change in the education process in order to manufacture a technology-skilled workforce (see Section 2.2 – The Singapore Context), but there is a lack of guidance on how such change is to be implemented and achieved. For instance, the specific policy that addresses technology in education in Singapore is the Masterplan for IT in Education (MP1) but, given the nature of the proposed changes, teachers are faced with significant challenges to use the new IT resources in schools to facilitate the Government's desired outcomes. There is no clear sense of what good practice looks like or how to implement the plan (Deng & Gopinathan, 1999). Such a policy thus appears to be "a leap of faith into the dark" (Towndrow, 2001;27).

Despite these uncertainties, research has shown that ICT has the 'potential' to add value to teaching and learning. There is, for example, a belief that integrating technology in education supports the development of higher-order thinking skills through cognitive operations facilitated by the use of technology (Salomon, 1993). The research literature reports of improved motivation and engagement (Watts & Lloyd, 2000), higher levels of deep and strategic learning styles (Gibbs, 1999), and support for teacher trainees'[1] confidence in practice and collaboration (Selinger, 1997). The literature states, though, that for effective transformation to occur, the technology must be embedded into the

[1] Teacher trainees and pre-service teachers will be considered synonymous throughout this thesis.

teaching and learning of the institute (Britain & Liber, 2000), and that teachers, in particular, will need to acquire new skills in moderation of course content and delivery by creating opportunities for interaction (Montieth & Smith, 2001; Salmon, 2002). However, numerous studies in technology integration tend to concentrate on the technical advantages rather than focus on the quality of teaching and types of learning (Knipe & Lee, 2002). An online learning environment[2], for example, is mainly used to present and deliver information (Freeman, 1998). Participants in Freeman's study were, for example, reluctant to discuss and raise questions. Thus, despite reports stressing the hypothetical benefits of ICT for communication, sharing and collaboration (Jonassen, Peck & Wilson, 1999), online learning environments tend to result in a technological equivalent of the didactic approach to content delivery (Knipe & Lee, 2002).

There has also been much debate in the past few years as to the fit of technology within the classroom. Should technology be taught separately or integrated into the curriculum? Is there a pedagogy of ICT? If there is, why not consider 'pedagogy and the chalkboard' or 'pedagogy and pencils'? (Loveless, Devoogd & Bohlin, 2000). IT impacts on teachers in many ways. It effects the context of teaching, approaches to teaching, beliefs about subject matter, classroom management skills, and personal characteristics. In short, IT impacts upon pedagogy. Sandholtz, Ringstaff, & Dwyer (1997) and Loveless *et al.* (2000) report that teachers who were positive about technology tended to be more constructivist in their teaching and were confident users of digital tools themselves. On the other hand, less technology-literate teachers tended to have a more didactic approach to teaching, with or without technology. In addition, generic Information Technology (IT) or Information Communications Technology (ICT)[3] courses for teacher trainees or in-service teachers[4] have often failed to live up to expectations. For example, the Teacher Training Institute has stated that the ICT training initiative implemented by the British

[2] Online learning environments, Virtual Learning Environments (VLE) or e-learning offer the opportunity to support interactivity or communication beyond that provided by a single computer.

[3] IT is considered Information Technology where the context has traditionally been upon the technology (the bits and bytes) whereas ICT is Information Communications Technology where the 'C' indicates a convergence of information through technology facilitated by communication. Throughout this thesis the use of technology in education utilising either of the terms are considered synonymous unless specifically stated otherwise.

[4] In-service teachers are considered those practicing at schools and are either receiving some form of training (often termed 'staff development') at their locale or in another educational institute (such as a university).

Government has failed despite massive investment in funds, resources and time (Revell, 2003). Moreover, as mentioned above, major investment in technology in education has been made worldwide but no more so than in Singapore where an IT Masterplan directly supports the Government's desired outcomes in education (see Section 2.2 – The Singapore Context). However, in Singapore the only published survey of graduate teachers indicated that over 44% were considered inadequately prepared to use ICT in the classroom despite the enormous funds allotted by the Masterplan for IT in Education[5] (Hu, Wong, Wong, Cheah, & D'Rozario, 2004).

To support the integration of technology in teaching and learning, the academic literature reveals a number of key factors (Selwyn, 1997; Knipe & Lee, 2002; Levy, 2003). These have been summarised and categorised in Chapter 2 – Literature Review, as activities, integration, collaboration, and shared spaces (see Section 2.7 – Characteristics of Informed ICT integration). Briefly, teachers should offer students self directed learning activities that encourage self expression, teachers should receive extensive training in the integration of technology with the curriculum, and teachers using computers benefit from a social network of other computer-using teachers at their school. Also, small group collaboration on computers is especially effective when students have received training in the collaborative process. In recent years there has been a proliferation in audio and visual communication, such as video conferencing and Internet telephony[6], by users at remote locations due to the recent development of high speed broadband networks. The research in video-conferencing for educational purposes is not encouraging though. For example, ensuring student participation is challenging for the teacher (Tyler, 1999), and technical problems cause frustration. As previously mentioned, teaching in these online learning environments tend to replicate lectures (Freeman, 1998), while computer use by teachers in the classroom has not altered the delivery of information (Tapscott,1998; Cuban, 2002). To help teachers utilise technology in a more pupil-oriented learning environment, a technology needs to be considered that would prove difficult for teachers to mimic didactic practices and, at the same time, facilitate the implementation of the aforementioned key factors of informed ICT integration. Recent

[5] Singapore's Masterplan for IT in Education is discussed in Chapter 2 - The Literature Review.
[6] iChat (http://www.apple.com/ichat) facilitates video conferencing whilst Skype (http://www.skype.com) facilitates VoIP (http://en.wikipedia.org).

synchronous technology development using broadband networks, for example, has led to the ability to communicate whilst simultaneously collaborate synchronously on a word processing document (see Section 1.3 – Synchronous Networking Technology). In other words, students and teachers at remote locations can communicate using text as well as voice in the development of a shared, collaborative document. Multiple users at different locations, all working in real time on one document, would not be possible without the synchronous technology. By utilising synchronous networking technology then to support teaching and learning, it is anticipated teachers will need to reconsider their practices in developing tasks, and that such practices would require teachers to move beyond their didactic pedagogy. It is thus further anticipated that research of teachers using synchronous networking will provide new perspectives and experiences in technology-based learning that may produce new knowledge that can inform the literature on technology in education.

A Case Study approach will be adopted this research (detailed in Chapter 3 - Methodology). Moreover, an effective strategy for ICT integration by teachers is to place the teacher at the centre of informed use (see Section 2.7 – Characteristics of informed ICT integration). The participants, BEd final year teacher trainee undergraduates (see Section 3.5 – Sampling), will therefore be involved in developing and reflecting upon their implementation of ICT; in this research, specifically synchronous inter-networked technology based tasks. Through such practice-based research, the types of activities and cognitive outcomes that occur will be identified in order to evaluate, in this thesis, the experience of synchronous networking technology in an academic environment. By comparing qualitative and quantitative data of the processes involved in the development and application of synchronous networking tasks, a body of information will become available for analysis and critique. Immersing trainee teachers in synchronous network technology rich tasks embedded into a teacher training course module, this Case Study research therefore aims to identify associated activities and cognitive outcomes, and the implications these may have in terms of constructivist epistemology (Levy, 2003).

Although technology has been integrated into education for over 30 years, teachers today are still struggling to meet the demands of their profession, and to make their classrooms more learner-centred and flexible with or without technology

(Matthews, 1998; NCES, 1999; Russel, Bebbel, O'Dwyer, & O'Connor; 2003). In addition, there is a desire to develop human capital motivated by education policies that incorporate, and focus heavily upon, technology. However, it has been revealed that such policies lack guidance for practitioners in education. Cuban (2002), Postman (1992), Stoll (1999) and others thus challenge educators to a wider discussion on technology integration for the desired transformation to a pupil-centred learning environment. The purpose of this study then is to demonstrate that an effective transformational strategy for pre-service teachers adopting technology can be facilitated by synchronous inter-networked based tasks whilst, at the same time, empower practitioners to effectively integrate ICT in an informed manner.

1.3 Synchronous networking technology

At this juncture it is important to present a summary of synchronous networking technology so that the technical context of this research is made clear. Learning in networked environments occurs through the promotion of connections between learners, between learners and instructors, and between a learning community and its resources facilitated by networking technology (Goodyear, 2000).

Synchronous networking technology may be exemplified by what is commonly referred to as CHAT[7] rooms. Essentially a CHAT room is an online medium where many users can input text and, in some cases, graphics, documents, video files and programs simultaneously. In other words, a system being used at the same time by, in an educational context for instance, students in one location and a teacher in another. Another synchronous networking technology tool is video-conferencing where users can see and hear each other on a computer using dedicated software. ICT technology (circa 2005) may be considered a blend of synchronous and asynchronous networking but as ICT develops there are, "convergences between the two emerging in contemporary and online environments (Steeples, Jones & Goodyear, 2000).

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[7] CHAT is an acronym for Conversational Hypertext Access Technology

Recent business communication developments are using networking technology such as zero configuration[8] and IP address linking[9] to connect computers. Within Microsoft Windows Server 2003 edition[10] and Office 2003, synchronous networking technology is exemplified by its Sharepoints utility. This allows a user to create a master document and store it on the server. Another assigned user can then edit the document in real time while others view and edit after being provided access. However, the technical disadvantage is that Sharepoints requires the aforementioned server. An alternative is to use peer-to-peer (P2P) networking where computers are connected directly without the need for an intermediary server[11]. For instance, a P2P application called iStorm[12] facilitates document collaboration. This has a unique interface that blends CHAT, video-conferencing and real time document collaboration space in one window (See Figure 1.1. iStorm interface). Briefly, users open iStorm on their computers. As user 1 is typing into the document frame, other users can see the text construction (i.e. in real time). The other users can text chat in the CHAT window in readiness for their contributions. In addition, two users can video-conference and discuss the development of the document. iStorm has an innovative design that encompasses the desired blend of CHAT, video-conferencing and real time document development collaboration unique to synchronous networking technology as it uses both zero configuration and IP address linking. iStorm will thus be utilised in this research as the synchronous networking technology application.

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[8] Zero configuration information is available at http://www.zeroconf.org/ Also known as Rendezvous and Bonjour (computer software for the automatic configuration of computer networks, computer programs, computer peripherals and other electronic devices).

[9] IP or Internet Protocol is the unique address assigned to a computer by a server when online

[10] Windows server 2003 will be superseded by Vista (current codename). See http://www.microsoft.com/windowsserver2003/ for more details

[11] Napster used P2P to allow users to connect and download music files (albeit illegally).

[12] iStorm is available at http://www.mathgamehouse.com/istorm/

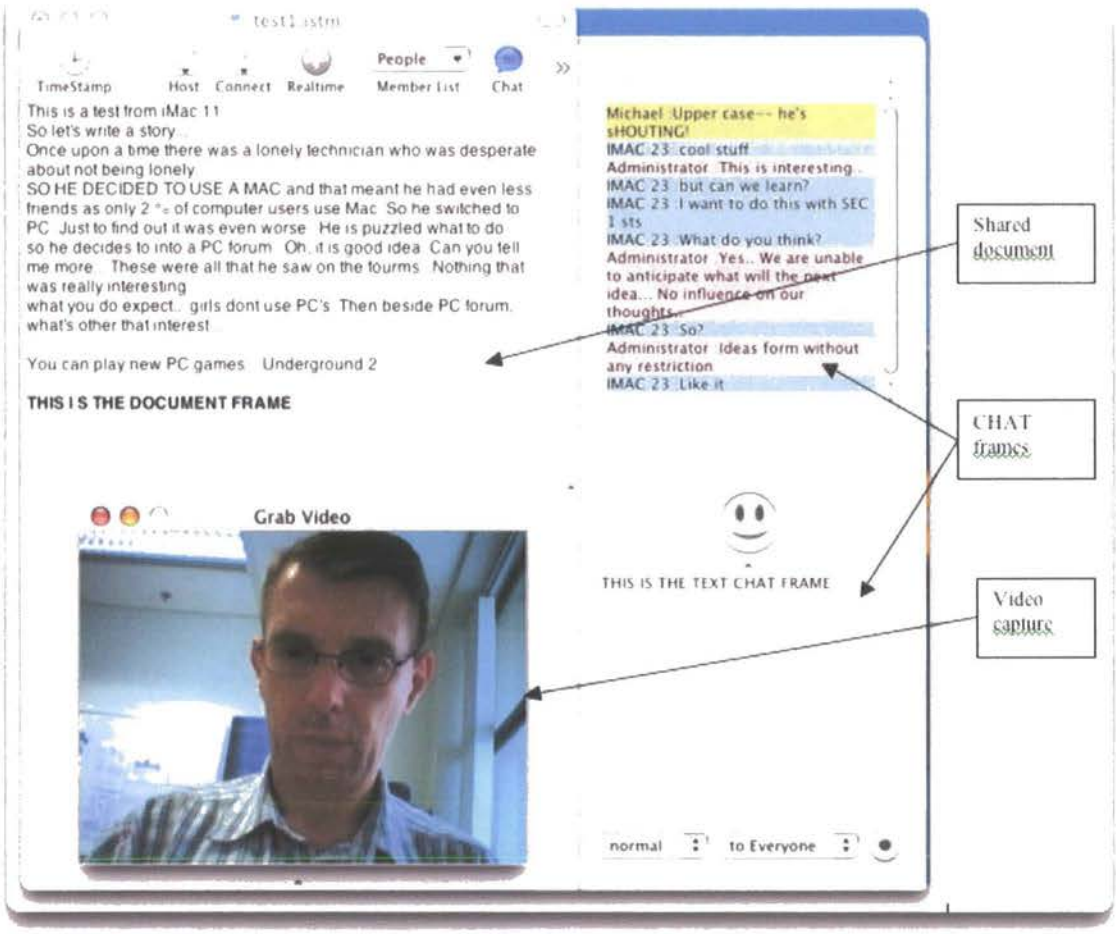

Figure 1-1 iStorm interface (synchronous networking technology)

1.4 Researcher's intent

The researcher's intent in this topic arises from his experience of training school teachers and Higher Education academic staff in ICT integration. Pre-designed syllabi have been adapted and in 2001 the researcher co-authored a course-book for teacher trainees and in-service teachers entitled 'Using IT in the Language Classroom: a guide for teachers and students in Asia' currently in its third edition (Towndrow & Vallance, 2004). This was the development of 14 years of experience teaching with technology in Asia and Europe. While teaching students utilising this course-book, it was observed that further refinements were needed in each cohort taught. Such modifications at the classroom level allowed the researcher to not simply train learners in ICT competency but, more importantly, to continually challenge the learners to evaluate and reflect on how they would integrate ICT in an informed manner. It is the researcher's hypothesis that a different approach to ICT teacher training that involves the informed use of synchronous inter-networked tools and related tasks is required. This is developed in Chapter 2 – Literature Review.

1.5 Research question

The time is ripe for research in emerging ICT such as synchronous networking technologies in educational contexts. This thesis aims to address a particular research question that the literature review revealed to be inadequately covered:

> How does the use of synchronous networking technology impact on ICT integration by pre-service teachers?

CHAPTER 2 - LITERATURE REVIEW

This chapter examines the literature relevant to this study. First, a background of the context of the study and its locality will be explained. Of particular interest is the educational policy of Singapore that promotes the development of ICT in schools. The two key goals of this policy (named Masterplan for IT in Education - MP1) relevant to this research are those of collaboration, and new teaching and learning strategies. Following this is a global overview of the use of ICT in classrooms by teachers in the USA, UK and Singapore. For instance, a summary of a 12-year longitudinal study in the USA on ICT integration by in-service teachers is discussed to exemplify how practitioners changed their beliefs over time. The results support the premise that for successful ICT integration, teachers need to re-position themselves from broadcasting content to supporting interactive learning. The context of preparing pre-service teachers is then discussed. For instance, despite growing up in a digitally rich environment, nearly half of the young, graduating teachers at Singapore's National Institute of Education felt inadequately prepared to use technology in class (Hu *et al.*; 2004). The problem of teachers not being prepared to support interactive learning can thus be identified. As such, recommendations for informed ICT integration are then developed. A latter section offers an often neglected perspective by those less convinced of the benefits of teacher education and ICT integration at the school level. Finally, a list of key factors that determine the fit of ICT in teacher development is offered as a basis for research; in particular, synchronous networking and teacher training.

2.1 Growing up digital

Wired, a respected magazine targeting the techno-literate of the 21st century, boldly announced the arrival of the Net-Generation when it wrote, "It takes a generation to unlock the potential of transformation technology – we are that generation" (Born Digital, 2002). In effect, teachers are now teaching youngsters who would not recognise a world without multimedia technologies, the Internet and global communication[13]. In the USA, for example, 20% of children access the Internet from home (IM Programs Draw US Kids And Teens Online, 2002). In Singapore, children below 15 account for 19.4% of home computer usage (Survey on InfoComm Usage in Households 2000; 2002). Even in China, there is an ever-increasing number of young learners who use digital technologies (China's Net Population on the Increase, 2002[14]). For these 'Net-Geners', today's digital lifestyle incorporates a multitude of emerging technologies such as IRC, MP3, iChat, SMS, MMS[15], etc. all with the aim of promoting synchronous and asynchronous communication. Many of today's youngsters debate, argue and collaborate, often with an attitude considered assertive by their parents and teachers. For instance, they effortlessly communicate and rely upon one another for information such as new music downloads, freeware for powering their computers, and plug-ins to enhance their gaming experiences. Don Tapscott's book 'Growing up digital. The Rise of the Net Generation' offers a stern warning to employers, educators and parents that the digital devices prevalent in today's society is thus having an impact on the way children communicate with their peers, resulting in expectations of a world much different to that viewed by an older generation.

> "One of the great stories of the dawn of the new millennium will be the ascendancy to power of the Net Generation. More than 88 million strong, these youngsters are the biggest demographic group in the United States and Canada. The oldest of this generation are now entering the labour market, bringing with them their profoundly different notions of work, reward, responsibility, and collaboration" (Tapscott, 1998: ix).

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[13] It is acknowledged that the research is considering youngsters from affluent countries or emerging nations, and that most children of the World lack access to basic amenities such as water and electricity, let alone computers and the Internet. However, the context of this study is located in Singapore where technology is, in general, accessible and affordable to most of its citizens.

[14] It is recognised that the credibility and reliability of online resources need to be considered. Some data, such as statistics from China, may only be found, in English, via the Chinese media. Therefore, the data is presented cautiously but helps contextualise the information stated in the main body of the thesis.

[15] Many of these technological acronyms change frequently. It is suggested a visit to Webopedia online (http://www.webopedia.com) will explain the latest terms.

Tapscott (1998) suggests that the previous generation were indeed brought up with technology but of a kind that simply broadcasted information. Broadcast technology is personified by the television, which has pre-determined, fixed scheduling and limited channels of delivery. Similarly, in education there are Learning Management Systems (LMS) such as BlackBoard or WebCT where courses can be stored, managed and tracked online. Such broadcast delivery of information is, "one way centralised with an emphasis on predefined structures that will work best for the mass audience" (Tapscott, 1998;129). Tapscott reasons that uninformed and pedagogically unsound LMS computer-based instruction environments promote information delivery and subsequent broadcast model of learning. In other words, the education courses are not customised for individual needs within particular contexts at particular instances of learning opportunities. If educational establishments promote the use of LMS (such as BlackBoard or WebCT) then it is argued that students are not being prepared to be the collaborators and critical thinkers desired of industry (Digital Workstyle, 2005) in today's Digital Age, "in part because the broadcast model of learning is an obstacle to such development" (Tapscott, 1998;134). Students' educational, employment and cultural opportunities will be shaped by their ability to understand and manage emerging technologies (Hesselbring, Barron & Risko, 2000), which require teachers to consider a more informed integration of technology that promotes collaboration and communication. Teaching today's digitally literate learners will thus challenge teachers in new and exciting ways. This is recognised by education authorities (Ministry of Education, Singapore, 2002), the teaching profession (MAPE, 2002), students (Born Digital, 2002) and industry (Gates, 1996) but, as will be shown, the literature lacks cohesive strategies for teachers to utilise and integrate technology to best support collaboration and communication. Given that many pupils in the classroom within the context of this study are competent users of technology, it is timely to look at the locale of the research, the impact and challenges of using technology in an informed way in education, and the concerns about the rush to integrate technology.

2.2 The Singapore context

In Singapore[16] the current emphasis is Ability Driven Education, married to the Thinking Schools, Learning Nation (TSLN) and Masterplan for IT in Education (MP1) policies. In 1997 the Singapore government launched the Thinking Schools, Learning Nation (TSLN) policy to equip students with skills to face the future challenges whilst promoting a culture of lifelong learning (Goh, 1997). Essentially the educational system was being used to advance Singapore's human capital; the independent development of the self (Towndrow, 2001). As stated by Woodhall (1997), "The concept of human capital refers to the fact that human beings invest in themselves, by means of education, training or other activities which raise their future income by increasing their lifetime earnings" (p.219).

Aligned with the Thinking Schools Learning Nation (TSLN) initiative was the need to develop digital literacy, infrastructure and technology. To partly enable this, the first Masterplan for IT in Education (MP1) was launched on 28th April, 1997. The main goals were to enhance linkages between schools, allow teachers and pupils to communicate and collaborate, develop new teaching and learning strategies, open new possibilities for curricula and assessment, enhance creative thinking, lifelong learning and social responsibility, and promote administrative and management excellence in the education system (Teo, 1997).

Due to the changes in the economy and the impending prolific utilisation of IT in everyday life in Singapore, the overall aim of MP1 was to thus ensure young people are, "comfortable with new technology and be able to exploit these new technologies to venture beyond their current boundaries and open up new frontiers of knowledge" (Teo, 1997). The Singapore government hypothesised that it really had no choice. Linking the

[16] Singapore is an island nation with a population of 4,452,732 and a Gross National Product (GNP) of \$106.3 billion (The World Fact Book; 2002). Since independence in 1963, different economic and educational development strategies have been employed; from survival driven education in 1960 to efficiency driven education in 1975 to the current economically diverse Knowledge Based Economy (KBE). The largest portion of Singapore's national budget is allocated to education, health and public housing. In 2001 education was allotted 22.38% of the national budget, which was an increase of \$8.3 million on 2000. Key education expenditures include: \$2.7 billion to subsidize operations of primary, secondary and junior colleges; \$160 million to subsidise the operations of technical institutes; \$550 million to subsidise the operations of the polytechnics; \$900 million to subsidise the operations of the universities; \$1.1 billion to develop educational infrastructure, and acquisition of computer equipment. (Ministry of Finance, 2001)

needs of the future economy to education and IT, the Minister for Ministry of Information, Communications and the Arts (MITA) commented, "It is crucial that the next generation is prepared for the IT world...Failure to educate them will result in society having to carry a heavy burden for the rest of their lives" (Yeo, 1999). With the rapid change in global industries from agricultural to industrial to information technologies, together with the political will to subject academia to market forces, there is great demand on education to keep pace with the developments in the business sector (Silver, Hu and Iino, 2002)

2.3 The impact of ICT in the classroom

Now that a context for the study of technology integration has been presented, it is timely to look at the impact of ICT in education.

In the following Section 2.4 – Challenging current practices of in-service teachers, the Apple Classrooms of Tomorrow (ACOT) research is discussed in detail. In summary, the experience of ACOT students and teachers resulted in higher level reasoning and problem solving skills, and there was a positive impact on student attitudes. The research challenged teachers' classroom practices towards a more cooperative groupwork environment and a social constructivist pedagogy (Sandholtz, Ringstaff & Dwyer, 1997). However, the ACOT students scored no better than nationally reported norms in standardised tests in English, Maths and Science (Schacter, 1999), and had selective positive impact on writing (Baker, Gearhart & Herman, 1993).

The observations of Schacter and Baker *et al.* may appear to be representative of the research on technology in education. For instance, Parr (2003) reported on a number of large scale studies of the impact of learners using IT (primarily individualised drill and practice programs) that had been conducted in the late 1960s and 1970s. Parr (2003) could not conclude from the studies whether computer instruction was advantageous or that materials specifically designed for computer-based instruction were given more consideration and attention,

" (the studies) show a general learning advantage for CAI [Computer Aided Instruction] over traditional instruction, though the level of effectiveness of CAI may vary with specific student population, course content and CAI type. However, it has yet to be established if this gain is simply an artefact of poor research design. Another explanation is that the advantage stems from the generally superior quality of CAI materials, rather than from some intrinsic characteristics of the computer technology as a vehicle of instruction."

The numerous studies mentioned by Parr however were considered inconsistent in so much as they utilised a box-score technique which only illustrated a proportion of studies where favourable results occurred by students who used IT over those who did not. Parr reported that the limitation of the box-score review was that the studies reported 'how often' a study was favourable but not 'how much'. Moreover, common characteristics of effective use of IT within the studies were not combined and elaborated upon (Parr, 2003).

Meta analysis has also been utilised to assess effectiveness across studies using a common measure called an effect size (ES). Effect size is a way of quantifying the difference between an experimental group that receives a treatment and a control group that does not receive a treatment. A positive effect size is an attempt to represent the effectiveness of the treatment. For instance, an effect size of 0.8 means that, "the score of the average person in the experimental group exceeds the scores of 79% of the control group" (Coe, 2000). For example, McNeil & Nelson (1991) found in an analysis of cognitive achievements when using interactive video an effect size of 0.5, thereby demonstrating a moderate yet positive impact of a specific technology utilisation. Kulik (1994) used meta analysis to aggregate the findings from 254 controlled evaluation studies, and discovered that technology rich classes had an effect size of 0.3; that is, moderate but significant (Fitz-gibbon & Morris, 1987). In the context of writing and word processing, Bangert-Drowns (1993) found an effect size of 0.27 for improvement of the writing skill in favour of the use of a word processor. However, in the studies reviewed by Bangert-Drowns and Kulik, the terms 'technology' and 'writing' appear generalised. In other words, there lacks specificity of the technology utilised and which components of writing were promoted. For instance, enhancing the writing skill encompasses developing vocabulary, grammar, structure, text cohesion, awareness of genre, etc. Or did the use of a word processor merely increase participants' operational skills? These figures demonstrate that using computers may have a positive impact, but may have neglected external factors that can also impact upon studies in technology for teaching and learning (such as access to the technology by the control groups outside the confines of the study, in a library or at home). Therefore, one has to be cautious of the results of meta analysis, as confirmed by (Parr, 2003); "...data used to calculate effect sizes in many meta analysis might come from studies that are methodologically flawed."

There additionally appears to be much research on assessing teachers' and students' attitudes and behaviour towards computer usage yet there lacks evidence of a relationship between these and learning outcomes (Wood, Underwood & Avis, 1999). As stated by Wood *et al.* (1999), "...any exclusive reliance on user satisfaction as an index of effectiveness of technology should not be taken at face value and should be treated with considerable caution in the absence of converging evidence for effects on performance and learning" (p.95). Moreover, numerous studies in technology integration concentrate on the technological benefits rather than focus upon the quality of teaching and types of learning (Knipe & Lee, 2002).

Finally, Sivin-Kachala & Bialo (1996) point to the importance of the role of the educator and the level of student access to technology. For instance, Ryan (1990) conducted a meta analysis of 40 studies and found an ES of 0.309. Ryan concluded that, "the amount of technology related teacher training was significantly related to the achievements of students receiving computer based instruction" (p. 6). This, it is reasoned, illustrates the importance of providing effective ICT training for pre-service teachers.

In general, findings from box score reviews and meta analysis may suggest that ICT integration advantages learning over that offered in the traditional mode of instruction and associated broadcast learning but "the level of effectiveness of CAI [Computer Aided Instruction] may vary with specific student population, course content and CAI type" (Parr, 2003).

It is therefore reasoned that utilising a Case Study approach (as detailed in Chapter 3 – Methodology) will account for the strengths and weaknesses of previous research, in an attempt to provide insights to 'effective' teaching and 'good' learning through the 'informed' use of technology, thus adding value to the literature by moving beyond a discussion of the merits and pitfalls of computer-facilitated instruction.

2.4 Challenging current practice of in-service teachers

Critical to the research that blends computer technology, teachers and learners is not only the manner in which ICT is integrated, but also how the related tasks are implemented. For instance, in order to gain such an understanding of the impact of computer technology on teachers (and learners), from 1985 to 1998 researchers from University of California, Los Angeles (UCLA) and Ohio State University teamed up with a computer company to embark on an ambitious research project called ACOT (Apple Classrooms of Tomorrow). Apple computers were installed in five schools throughout North America (and later Europe) and researchers monitored their integration and utilisation. Teachers kept logbooks and submitted regular taped reflections. After twelve years, the researchers published ACOT's first results in Sandholtz, Ringstaff & Dwyer (1997). The pioneering researchers reported a five phase evolution in the roles of teachers who incorporated technology. These are presented below with illustrative citations from Sandholtz *et al.* (1997):

Phase	Description	Teachers' Comments
Phase 1: Entry	As computers were first introduced to the classroom the students were obviously excited. Nervous teachers reported that their initial role was that of disciplinarian.	"We discovered a common pattern of concerns that included the following categories: student misbehavior and attitudes, the physical environment, technical problems, and software management, and the dynamics of the classroom environment" (p. 57).
Phase 2: Adoption	Lessons were still mostly in the teacher controlled lecture and recitation format. However, once the teachers became familiar with the operation of the computer they became more relaxed and began to evaluate subject specific software. The teachers also started teaching basic computing skills. As a result, the teachers' roles were that of evaluator, instructor, designer and learner.	"The addition of technology to classrooms eventually led to different instructional goals for many teachers. They viewed instruction in terms of larger goals and worried less about whether they were teaching specific content to students" (p. 66).
Phase 3: Adaption.	As students began to use word-processing, graphics and database software more regularly, the teacher began to facilitate, motivate and monitor. The tasks became more student-centred. Also, the computers were additionally used for remedial work and test practice thereby freeing up the time of the teacher.	"The setup in ACOT makes it possible for the classroom to be more learner centred than teacher centred. I find myself being more of a facilitator. I'm sure that I will change even more as I learn more techniques" (p. 71).
Phase 4: Appropriation.	As the teachers' personal attitudes to technology changed, this led to a change in classroom practice. The teacher became a confident expert but also a willing learner (often learning from the students). Traditional practices began to be replaced by new habits. Report cards, lesson plans, correspondence and information retrieval were all now undertaken on the computer.	"Appropriation is less a phase in instructional evolution and more a milestone. It is evidenced less by change in classroom practice and more of personal attitude toward technology" (p. 42).
Phase 5: Invention.	This turning point led to teachers becoming more disposed to view learning as an active, creative and socially interactive process. Teachers began to reason that knowledge was something that learners had to construct for themselves and not something that could simply be transferred intact from teacher to learner. Teachers began to design lessons that therefore developed a more collaborative, problem-based, student-centred classroom which effectively incorporated technology.	"I was so excited after the first day, I thought it was too good to be true. ... Now we can simulate a newspaper company. Eventually students will work in groups, each with their own task, some for art, business graphs, articles, and the editing group" (p. 44).

Table 2-1 ACOT 5-phases of teacher development (adapted from Towndrow & Vallance, 2004)

From the comments summarised in Table 2.1 – ACOT's 5 phases of teacher development, it can be seen that the teachers over this period became comfortable with the technology. Moreover, the teachers evolved from being transmitters of information to facilitators of learning. They developed tasks and associated activities to promote a more learner-centred, constructivist environment. For example, Sandholtz *et al.* (1997) comment,

> "Though there was variation, the ACOT teachers became more disposed to view learning as an active, creative, and socially interactive process than when they entered the classroom. Knowledge came to be viewed as something children must construct for themselves and less as something that can be transferred intact" (p.47).

Sandholtz *et al.* assumed then that the ACOT teachers' beliefs in pedagogy altered over the research period and such change 'may' have been due to the integration of technology in their classrooms, and proposed that success with IT was best achieved through (a) teachers supporting teachers, (b) dialogues, (c) reflections, (d) observing best practice and (e) taking risks. For example, Sandholtz *et al.* report,

> "Over time, teachers personally appropriated technology for creative expression and personal work, and they used it to their advantage in managing the classroom and preparing for instruction. Teacher began to work together in teams, leading to new instructional ideas and increasing interactions with and support from colleagues. Teachers felt revitalised when they viewed themselves as learners again" (1997; 172).

The journey through the five phases (from Entry to Invention) was slow and arduous, thereby illustrating there is no quick fix often demanded of teachers.

In addition, Fisher, Dwyer & Yocam (1996) discuss a Knowledge Instruction – Knowledge Construction dichotomy and exemplify the changing roles of teachers and students, the classroom tasks, the concept of knowledge, and the demonstration of success through vignettes taken during the ACOT study. With reference to Table 2.2 – Attributes of Instruction and Construction Learning Environments, 'knowledge instruction' is seen as a transmission of facts, with learners working privately on drills or exercises from text books. The form of evaluation is facilitated by memorisation and the ability to recall facts on demand. Alternatively, in the 'knowledge construction' environment facts are important but within a meaningful context for a particular use. Inquiry, discovery, sharing and communication are considered key factors for successful learning. Evaluation of learners may be criterion referenced where standards are pre-determined, and tests may be in the format of presentations or public performances.

	Knowledge Instruction	**Knowledge Construction**
Classroom activity	Teacher centred (didactic)	Learner centred (interactive)
Teacher role	Fact teller (always expert)	Collaborator (sometimes learner)
Student role	Listener (always learner)	Collaborator (sometimes expert)
Instructional emphasis	Facts (memorisation)	Relationships (inquiry and invention)
Concept of knowledge	Accumulation of facts	Transformation of facts
Demonstration of success	Quantity	Quality of understanding
Assessment	Norm-referenced (e.g. multiple choice items)	Criterion referenced (e.g. portfolios and performances)
Technology use	E.g. Drill and practice	E.g. Communication (collaboration, information access, expression)

Table 2-2 Attributes of Instruction and Construction Learning Environments (Fisher, Dwyer & Yocam, 1996; 20)

In a recent study (The impact of computers on the lives of ACOT graduates: a follow up study, by Rob Tierney, Jane Bresler, and Ernie Bond at Ohio State University[17]) a number of ACOT student graduates were interviewed about the impact of ACOT on their lives. The graduates asserted that the ACOT experience helped them secure gainful employment (32%), allowed them to better work collaboratively in teams (40%), and had a positive impact on their salary (16%). However, only 20% felt that ACOT prepared them with the general knowledge required for tertiary study, and 16% stated they felt behind their peers in maths and science knowledge. Also, 12% felt that there was too much emphasis on technical competency in ACOT which may have contributed to a lack of general, maths and science knowledge stated by the graduates. The participants also

[17] The impact of computers on the lives of ACOT graduates: a follow up study, by Rob Tierney, Jane Bresler, and Ernie Bond at Ohio State University, is work in progress. The current findings were communicated via a CD-ROM of research data.

expressed frustration over their post-ACOT education experiences at the tertiary level, where the use of technology was often sidelined by the norms, expectations and traditional standards of university faculty. It may be interpreted that integration of technology in the classroom, as exemplified by the longitudinal ACOT study, did not have any significant impact upon the numeric grades or content acquisition by its participants, but did facilitate a shift in how knowledge can be sought and constructed. In addition, the ACOT study may be criticised for lacking a control or comparison group. Tierney *et al.* acknowledged this but suggested a number of benchmarks and incidental comparisons were available. For instance, one benchmark may be high school students from the same school as the ACOT students, where fewer than 50% of non-ACOT students graduated. The incidental comparisons were made by the ACOT students themselves, where a comparison with their peers revealed that ACOT offered advantages in vocational opportunities, expertise in IT tools, ability to collaborate and work in teams, and their frustrations with traditional ways of teaching and learning. In addition Baker, Gearhart & Herman (1993) re-visited the ACOT research after the initial five years and found that ACOT may have had selective positive impact on writing and on student attitudes but did not consider the impact of specific instructional usage or roles on specific outcomes.

Despite the weaknesses that the latter statements imply about its reliability, ACOT remains an important intersection in the research on the use of computers in schools. As opposed to experimental instances of technology integration over short periods, the 12-year longitudinal ACOT study observed a transformation of the teachers' beliefs in pedagogy; as represented by the 5 phases of development and the Knowledge Instruction – Knowledge Construction dichotomy.

Having thus provided a context, via ACOT, for changing pedagogy both in the teachers' practices and beliefs, it is timely to mention the Singapore context again as the Knowledge Instruction – Knowledge Construction dichotomy is representative of the desired pedagogical process espoused by the Ministry of Education in its TSLN and MP1 policies (discussed in Section 2.2 – The Singapore Context). The participants in this particular thesis/research, conducted in Singapore, may therefore be considered a product of the Thinking Schools Learning Nation (TSLN) educational policy initiated in 1997. As such, there is an expectation by educational policy makers that teachers in Singapore are facilitating a learning environment that supports thinking skills, creativity and enquiry (Immediate Outcomes of Education, 2004). However, it has been shown above that Hu *et al.* (2004) in their research of Singaporean teachers suggest otherwise (see Section 1.2 – Purpose of the Study) where, to recall, nearly half of the newly graduating teachers in Singapore felt inadequately prepared to use ICT in the classroom. Adopting a multi-faceted, multilayered Case Study approach (see Chapter 3 - Methodology), this research therefore aims to reveal how effective synchronous networking technologies and associated tasks can help facilitate a change in teaching beliefs of pre-service teachers (i.e. teacher trainees) despite the relatively short data collection period of 12 weeks compared to the 12 years of ACOT. In addition, this research notes how the trainees move from Knowledge Instruction based tasks (as attested by the early comments of the participants in this research that mention an insistence by previous mentors on the use of PowerPoint presentations, even in Primary school classrooms, to present information through a didactic pedagogy), to Knowledge Construction based tasks (as evidenced in later BBS postings after synchronous tasks were undertaken in this Case Study research).

Unfortunately, many teachers still teach they way they were most likely taught (Lortie, 1996) and pre-service teaching delivery (e.g. lectures) and assessment (e.g. timed written exams) sanction the practice of knowledge instruction at the teacher training institute. This may explain the intransigence of school and teacher training institutes to change which, in turn, results in the failure by teachers in general to embrace the knowledge construction paradigm. In Singapore, for example, there is a misunderstanding of the concept of technology integration by in-service teachers. Take, for instance, the case of school leaders in Singapore. In O.L Tan's (1998)[18] thesis 'Leadership styles and the implementation of the Masterplan' about 50% of school Head of Departments (HOD) placed their teachers in ACOT's Adoption phase (Phase 2) whilst 25% were in Appropriation (Phase 4) and Invention (Phase 5). Upon investigating the

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[18] There is a distinct lack of research literature in the public domain of the impact of technology at Singapore schools. Staff at the teacher training college, the National Institute of Education (NIE), have supervised a number of related MA dissertations that currently reside in the NIE library. Unfortunately, the supervisors and students appear not to have collaborated in sharing the findings and conclusions with the wider education community via published papers. Given access to the dissertations, the researcher of this Case Study concluded that Tan (1998) and Hsu (2000) were most relevant.

rationale and methodology of the thesis it appears Tan misunderstood ACOT's Appropriation and Invention phases. For example, Tan states that Appropriation and Invention can be characterised by the following statements: "Appropriation – I am able to use the computer to increase the effectiveness of my teaching and my students learning; Invention – I am able to integrate the use of computers with other media" (Tan, 1998; 51). In fact these are still considered in ACOT to be the earlier Adaption phase (Phase 3) (see Table 2.1). Correcting this anomaly the HOD information suggest that their 75% of teachers are simply adapting. Tan's thesis in 1998 incorrectly suggests otherwise. One HOD commented that he used e-mail to ask staff about their holidays and if they replied he offered a token. If this is IT integration then Tan's results are indeed misleading.

Additionally, there has been little improvement in the number of motivated adopters of IT-based instruction within Singapore schools since the launch of the Masterplan for IT in Education (MP1). Without an informed ICT training programme, the investment in MP1 may be wasted, as concluded by Tsu (2000); "Rushing teachers to adopt IT based instruction without a good grasp of the technology or understanding of the teaching strategies with IT can cause some unhealthy scepticism about IT-based instruction to persist for a long period of time" (p. 88).

2.5 Preparing pre-service teachers to use ICT

In the USA in 1994 only 3% of public schools were connected to the Internet. This dramatically rose to 77% in 2000 and 87% in 2001 (Internet Access in US Public Schools and Classrooms: 1994 to 2001 (2002). The actual use of the computer technology in schools though remains small. Becker & Ravitz (2001) found that only 25% of secondary English teachers, 17% of science teachers, 13% of social studies teachers, and 11% of maths teachers made weekly use of computers[19]. Moreover, the computers were not considered to be used to develop deeper understandings of concepts, tackling difficult topics or changing the approach to teaching methods.

However, official education statistics or published research on the effectiveness of ICT teacher training for Singapore are woefully unrepresented. As previously mentioned,

[19] In the UK, ICT courses for teacher trainees or in-service teachers have also often failed to live up to expectations; see Revell (2003).

a survey of graduate teachers' indicated that over 44% were considered inadequately prepared to use ICT in the classroom despite the massive funds allotted by the Masterplan for IT in Education (Hu *et al.*, 2004). They surmised that graduate teachers from Singapore's sole National Institute of Education (NIE) were ill prepared to use technology in their teaching at Primary, Secondary and tertiary level. Their research also stated misgivings about the impact of the pre-service training; "Their [the graduate teachers] inability to perform IT related tasks may or may not be related to NIE's training" (Hu *et al.*, 2004). In addition, Tsu (2000), in an unpublished thesis, states that many teachers in Singapore have still not been trained in IT usage and most have only rudimentary IT skills, let alone the pedagogical skills to use IT effectively in learner-centred classrooms. Also, MP1 encouraged the sharing of expertise and cultures between schools yet a visit to the Singapore's Teachers Network bulletin board system (BBS) will not reveal much sharing of teacher resources, information or collegial advice. Additionally, the instructional resources to be developed and implemented under MP1 present significant challenges to teachers in Singapore. For instance, Deng & Gopinathan (1999) suggest that the conventional teaching practices (teacher centred content delivery and student rote learning prevalent in the Singapore classrooms) do not support the progressive pedagogy required by the IT Masterplan. Therefore, recognising such inadequacies, there is a demand for research in delivering ICT courses which allow for informed discussion on pedagogical practices together with an understanding of the effective integration in the curricula, particularly in Singapore.

A major global challenge then is to help teachers with informed use of ICT integration in their educational settings. For instance, if only 33% of teachers in the United States felt adequately prepared to use the computer in the classroom (US Department of Education, 2000) then it is possible to surmise that the traditional training sessions have been ineffective at preparing teachers to integrate classroom technology. The workplace training model often employed (i.e. experts introducing teachers to new strategies) may be suitable for developing specific technological skills (e.g. learning how to use a computer) but it does not prepare teachers to address the issues of pedagogy. Teachers who receive training are indeed more likely to use technology but are often unprepared to change their teaching beliefs (Mouza, 2002). In effect, teachers use technology to reinforce their current, didactic teaching practices (Lortie, 1996; Zhong & Shen, 2002). As shown by ACOT, and further discussed in the next section, ICT integration is best served through the adoption of a more student centred, integrative approach.

2.6 The challenge of ICT integration

To improve the quality of ICT preparation for teachers and increase the number of exemplary teachers integrating technology, a number of outcomes from the research literature are consistent: facilitate cooperative learning models; incorporate higher-level thinking skills; increase communication between students and teachers; provide authentic contexts; accommodate flexibility to address different learning styles; create constructivist environments (Jordan & Follman, 1993; Hesselbring, Barron, & Risko, 2000). In addition, ICT training that is aligned with the curriculum and relevant to what teachers do in their classrooms are considered most effective (Kennedy, 1999). Such training in the integration of technology into the curriculum is more helpful than basic technology skills training alone (Hesselbring *et al.*, 2000) and a combination of both integration and skills training is reported to be most effective (Trotter, 1999). Most importantly, successful integration of ICT by teachers in exemplary schools demonstrated, "a great deal of collaboration among students" (Sivin-Kachala & Bialo, 1996). Consequently, teachers need to change their perceptions of how technology would benefit their learners, and researchers need to continue to explore the relationship between teaching practices and technology use (Hesselbring *et al.*, 2000). As Becker (1994) states,

> "We must begin to produce systematic evidence that the kinds of teaching practices that we assume to be exemplary (i.e., the focus on writing, problem solving, and inquiry; and discovery-based learning) do result in the kind of improvements in student competencies that cognitive science research has implied is possible" (p. 319).

With reference to the ACOT research, Sandholtz *et al.* (1997) similarly conclude,

> " … instructional change can proceed only with a corresponding change in beliefs about instruction and learning. Teachers' beliefs can only be modified while teachers are in the thick of change – taking risks and facing uncertainty. … To the observer hoping for quick evidence of the efficacy of innovations, computers or otherwise, the process can only be frustrating and inconclusive. To those dedicated enough to make the commitment, the process can be very rewarding" (p. 54).

The context of transforming pedagogy is thus in urgent need of analysis and it is anticipated that this research will provide some insights that can be developed further.

For effective integration of ICT a number of recommendations in the research literature have been made. The following section represents a related summary and then this is followed by a definition for informed use; a term preferred over effective integration. McGrath (1998) places the teacher at the centre of informed use;

- teachers must become comfortable with the technology itself,
- explore software and internet resources to identify those which might enhance and enrich the curriculum,
- review the curriculum to see how best ICT can support lesson plans,
- experiment in class
- assess how well the integration of ICT worked and refine.

On the other hand, Nunan (1989) concentrates upon the learner tasks (rather than the technology), in which tasks are required to have the characteristics of;

> " a piece of meaning-focused work involving learners in comprehending, producing and / or interacting in the target language, and that these tasks are analysed or categorised according to their goals, input data, activities, settings and roles." (p. 11)

Given these two perspectives, Towndrow & Vallance (2004) focus upon the design of meaningful tasks within the context of communicative language teaching as the key to successful, informed use of ICT. As a result, they build upon Nunan's definition in order to show how good tasks can be used to maximise opportunities for meaning-focused work to occur both in and beyond classrooms. To aid their definition of 'informed use' they develop Candlin's (1987) criteria for good task design,

- promote attention to meaning, purpose and negotiation
- allow for flexible approaches to the task, offering different routes, media, modes of participation and procedures
- allow for different solutions depending on the skills and strategies drawn on by learners
- be challenging but not threatening to promote risk-taking
- require input from all learners in terms of knowledge, skills and participation
- involve language use in the solving of the task
- allow for co-evaluation by learner and teacher of the task and of the performance of the task
- promote sharing of information and expertise (Candlin, 1987; 10).

These criteria will be taken into account by the researcher and participants in the development of the tasks utilised throughout this Case Study[20]. Candlin does not make any specific mention of activities that require the use of ICT in their completion. However, based upon this criteria, Towndrow & Vallance (2004) consequently propose a definition for informed use of ICT within the context of English language learning, but also applicable across all subject disciplines:

> "We assert, therefore, that if IT is used in language learning then it should be done with the intention of adding value to 'good' tasks. That is, the technology should make these tasks even more worthwhile" (p.82).

This definition of informed use will be utilised throughout the study; in preference to the term, effective use. Effective use implies the need to produce a tangible, quantifiable,

[20] As mentioned in Section 3.5 Sampling, the participants are teacher trainees on a course entitled *Computer Applications in Language and Literature*. Candlin's criteria is explicitly taught and referenced as these trainees prepare tasks to be incorporated in their lesson outlines.

measured outcome such as a test score or evaluation matrix. Informed use, on the other hand, critiques the process of the activities undertaken with ICT (by the teacher, the learner and the technology), the cognitive outcomes and the impact on learning.

Even so, successful use of ICT may quite simply be exemplified by a teacher giving an adequate presentation supported by a multiple PowerPoint slideshow. The teacher has delivered the required information utilising attractive and stimulating media, and the students have received the resulting content. However, the lesson is really no different from a traditional lecture as the teacher broadcasted the course content. Where were the periodic stages to check understanding, or the flexibility for students to raise questions which may have taken the planned lesson in a different direction (at which stage the PowerPoint slideshow may become irrelevant for the remainder of the lesson)?

Knowing 'why' the ICT is being used will facilitate a more informed use of ICT. Supporting delivery with PowerPoint is indeed effective and can be successful for learners if the teacher knows 'why' it is being used. The teacher can then confidently adapt and adjust the pedagogy during the lesson as questions are asked and understanding sought. The supporting ICT may not even be linear but include media or information that can be accessed on demand[21].

Informed use then is not something that is measured on a scale. Informed use is the ability of the user to consider particular ICT given its particular context and particular usage. It is to consider the learning, the students, the learning environment, the subject matter, the resources, the pedagogy, and the use to which the technology will be put. By understanding these factors the teacher will be better informed and will thus be able to adapt to unique moments throughout the lesson. For example, in the context of this Case Study, Task 3 allows the students to discuss in a CHAT frame about a local scenario representing the idiom 'Biting the hand that feeds it'. At one point in the CHAT, a student comments about the neglect of the older generation while attempting to exemplify the idiom. Another student expresses her understanding of the British approach to elderly care and the advantages of a Government supported welfare system over Singapore's reliance upon filial piety. The ensuing short discussion of social values, and not

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[21] One weakness of PowerPoint is that it enforces linearity on the user. An alternative is a media file such as a Web page that can leap around (using Hypetext MarkUp Language or HTML) as demanded by the user.

necessarily an English idiomatic phrase, appears to have motivated the student group to further emphasise and reinforce their local example in the Task. The teacher's role is that of observer as he allows the discussion to continue and willing to intervene with further information if called upon.

One example of effective strategies by the teacher and learner to adopt ICT in an informed way is the integration of 'good' learning tasks. These are interdisciplinary tasks, team based, exploratory and open in process and outcome that encourage participation and contributions by participants. The ICT utilised needs to support the resulting cooperation, collaboration and communication (Scardamalia & Bereiter, 1996). For instance, by integrating tasks using ICT, computer technologies can facilitate the locating, storing and retrieving of information (Gilster, 1997) thus actively engaging learners in constructing knowledge (Jonassen, Peck & Wilson, 1999).

The creation and representation of situations from which learners can solve problems and construct knowledge can be facilitated by synchronous Computer Mediated Communication (CMC). CMC lends itself readily to such contexts as long as the tasks are authentic and meaningful (Jonassen *et al.*, 1999). Knowledge building communities can be developed; for example, synchronous CMC together with an asynchronous Bulletin Board System (BBS) supports learners to, "actively and strategically pursue learning as a goal- that is, intentional learning" (Scardemalia, Bereiter & Lamon, 1994; 201). In effect, the students are creating their own knowledge databases in their unique knowledge building community facilitated by the informed tasks. As stated by Jonassen *et al.*,

> "When students own the knowledge, rather than the teacher or the textbook, they become committed to building knowledge, rather than merely receiving and processing it" (1999; 118).

In this study then the on-going text input to synchronous and asynchronous ICT applications (such as the collaborative document iStorm, a CHAT tool and a BBS) will be used to look for evidence in the formation of such a community. This can be undertaken by looking at the macro-level of language used for evidence of risk taking, innovation, teaching and learning contexts, frequency of contributions and academic quality of discussions (beyond social discourse). Although such dialogues are not considered central to this research, they will form part of the continuing process in the development of associated contexts in building a 'shared space' (see below) in the utilization of synchronous inter networked technologies.

The concept of the 'shared space' was introduced by Jonassen, Myers & McKillop (1996) when they wrote about a study of students working on a unit in English and social studies that was undertaken to discover rhetorical constructions, cognitive strategies and social negotiation students engage in when constructing hypermedia. Phenomenology (where data is collected through questionnaires, student logs, interviews, videotaping and observation) was used to study the learning process. The students were found to use a number of digital tools, some of which were unfamiliar to the learners and teachers. However, they worked collaboratively to discuss pathways to help them successfully achieve an outcome. While different groups constructed their unique paths of learning, the similar traits across all groups was the cooperative, non-competitive environment that resulted. This context was termed a 'shared space'. In these shared spaces the students cooperated to form knowledge building communities encompassing ownership and individual responsibilities that led to the collaborative development of a meaningful outcome. It is within a context of the 'shared space' that this phenomenological study aims to operate. Participants in this research will therefore use networked technology to construct knowledge and collaborate on tasks leading to a better understanding of educational technology issues. The activities throughout the research will therefore be captured and analyzed for their impact on the trainees' learning, and their reflections will be posted on a BBS configured solely for the BEd course. It is anticipated that providing part ownership of the design and implementation of tasks will lead to a voluntary development of a 'shared space' ; also referred to as Communities of Practice (Wenger, 1998).

2.7 Characteristics of informed ICT integration

This section will summarise the characteristics of informed ICT integration as revealed by the literature. For instance, online learning is where people learn over a geographical distance using networked technologies. The online learners, such as a group of students on one course, may not physically meet but still develop an online community. They can discuss asynchronously (using e-mail) or synchronously (using a CHAT facility). With a broadband network connection it is now additionally feasible to meet and communicate synchronously via video conferencing to work together on interactive whiteboards and documents. The online learning community is also a place for participants to collaboratively construct knowledge through generating, analysing and structuring information. However, it is naïve to think that merely linking distant individuals at different locations will create an effective learning environment (Knipe & Lee, 2002). The foundation of the online learning community is the sharing of knowledge between the learners, rather than the exchange of information. Information exchange is, at worst, enforced collegiality. For example, colleagues may provide information at the behest of fellow colleagues or as instructed by someone more senior. After delivering the information, the communication halts unless someone requests further information or clarification. Knowledge sharing, on the other hand, is the passing of information that the deliverer knows will be of benefit to the receiver, and that the gesture will be reciprocated in kind. The first transaction may indeed be deemed information exchange but over time the continued correspondence will result in a body of knowledge difficult to garner independently. The resulting information will have value to someone who will in turn seek to share the new found knowledge with the community. With reference to educational contexts, the members of the learning community thus create the content themselves with the support of others within the community rather than being provided with, say, pre-packaged, inauthentic subject matter such as that prevalent in academic courseware or commercial CD-ROMs.

To support such informed ICT training in education, the literature review highlights a number of key factors (see Section 2.9 - Summary). Such an extensive list has thus been categorised into four (4) prime characteristics that represent these key factors of informed ICT training.

Characteristic	Key factors	Description
Activities	Flexible	be flexible enough to address different learning styles (Jordan & Follman (1993), (Sandholtz *et al.*, 1997)
	Pedagogy	focus on the quality of teaching and types of learning as many studies in technology integration tend to concentrate merely on the practical advantages (Knipe & Lee, 2002).
	Opportunities for learning	a key factor to success of synchronous inter-networking is the instructor's skill in creating opportunities for interaction (BECTA, 2003)
Integration	A constructive environment	use technology to create constructivist environments which supported higher level thinking skills (Hesselbring *et al.*, 2000)
	Integration	training in the integration of technology into the curriculum is nearly always more helpful than basic technology skills training alone (Parr, 2003)
	Adding value	if ICT is used in learning then it should be done with the intention of adding value to good tasks. That is, the technology should make these tasks even more worthwhile (Towndrow & Vallance, 2004).
Collaboration	Collaboration	collaboration among students (Sivin-Kachala & Bialo, 1996)
	Cooperation	use cooperative learning models (Sandholtz *et al.*, 1997)
	Communication	increase communication between students and teachers (Jordan & Follman (1993), (Sandholtz *et al.*, 1997)
Shared spaces	Shared space	the activities, learning context and shared space should aim to meet the five qualities within a knowledge construction, constructivist learning environment: (1) teachers supporting teachers; (2) dialogues; (3) reflections; (4) observing best practice; (5) taking risks (Jonasssen *et al.*, 1999)
	Making connections	relate the skills to real-life situations (Jordan & Follman (1993), (Sandholtz *et al.*, 1997)

Table 2-3 Key factors for informed ICT integration

In addressing some of these concerns, Selwyn (1997) proposed a three-phase process for initial ICT training of educators: (1) confront fears; (2) customise learning; (3) adopt unique characteristics. The first phase is to confront the fears that teachers have about using ICT in order to demystify technology. By undertaking this the teacher can begin to appreciate that they are not alone and that computers are simply a tool (though the roles can be expanded[22]). For Phase 2, the content of the training needs to be customised for the learner's immediate context (that is, the teacher as learner). Each learner has a different set of needs and purposes which have to be reflected in the training. Thirdly, the

[22] For a detailed discussion of the roles of the computer, see Towndrow & Vallance (2004)

training should encourage sharing and communication in a non-threatening environment; as stipulated by Knipe & Lee (2002) above and Sivin-Kachala & Bialo (1996). Sivin-Kachala & Bialo (1996) in their report on the Effectiveness of Technology in Schools (95/96) concluded that ICT demonstrated significant positive effect on achievement and student attitudes towards learning. The level of effectiveness was determined to be influenced by the teacher's role, how the students are grouped and the level of access to the technology. This has also been highlighted by Ryan (1990), Sandholtz *et al.* (1997), Freeman (1998), and Knipe & Lee (2002).

Considering these issues, the tabulated literature review summary (see Table 1.1- Key factors for informed ICT integration) of key factors that impact on informed technology integration, in effect, represent a framework upon which to develop teachers to maximise the potential of ICT. This framework has been confirmed by Selwyn (1997) where the specific characteristics of activities, integration, collaboration, and shared spaces are deemed necessary if teachers are to adopt ICT. Supported by the literature, these four characteristics are consequently summarised in Table 2.4 - Characteristics to maximize the potential of ICT.

Characteristic	**Explanation**
ACTIVITIES	Teachers should offer students self directed learning activities that encourage self expression.
INTEGRATION	Teachers are more effective after receiving extensive training in the integration of technology with the curriculum.
COLLABORATION	Small group collaboration on computer is especially effective when students have received training in the collaborative process.
SHARED SPACE	Exemplary teachers using computers benefit from a social network of other computer-using teachers at their school.

Table 2-4 Characteristics to maximize the potential of ICT

These four characteristics form the foundation of Selwyn's third phase (i.e. adopt unique characteristics) in the development of the networked teacher training process, and all will be addressed in this thesis[23]. Moreover, an open and exploratory approach will attempt to alleviate negative attitudes thereby laying foundations for changing future ICT usage and approaches to teaching. For example, role-play is considered helpful in the development

[23] The Methodology chapter explains, in detail, how the characteristics will be addressed.

of an understanding of computer empowerment (Knowles, 1984), and will be employed during this Case Study. In addition, teachers being able to develop and reflect upon their own learning journeys can bring about a positive attitude to computer use. Training that puts ideas and skills to competent practical use in the classroom is highly valued. Consequently, content and relevance is considered essential for successful training in ICT utilisation by educators at all levels (Sandholtz *et al.*, 1997; Parr, 2003). Finally, the teachers need to share a common vision of how ICT can enhance their teaching and learning. This requires strong leadership by the instructor (and, eventually, the participants) and the development of a culture of sharing (Jonassen *et al.*, 1999).

2.8 The concerns about incorporating ICT in education

At this juncture it is prudent to discuss the concerns from those in academia less convinced by the advantages of ICT for teaching and learning. In July 2002 the US Secretary of Education's annual report on teacher quality controversially suggested that pre-service teaching and attendance at Institutes of Education be optional, and not a compulsory certified requirement. The report stated that pre-service teacher education and certification were not related to teacher effectiveness, teachers completing education programmes were academically weak, and that alternative certification programmes produced academically stronger and highly effective teachers. The Secretary's report also stated that, " a majority of graduates of schools of education believe traditional teacher preparation programmes left them ill-prepared for the challenges and rigors of the classroom" (Darling-Hammond & Youngs, 2002; 15). Darling-Hammond & Youngs (2002) discuss this report in detail but question the often erroneous interpretation of the collected data and the sample utilised. For instance, the Secretary's report stated that less than 30% of new teachers felt prepared to integrate technology in instruction. By combining two categories in the report's Likert scale ('very well prepared' and 'moderately well prepared'), Darling-Hammond & Youngs calculated that 57% of new teachers were adequately prepared to integrate technology in the classroom; nearly double that presented in the Secretary's report. Whichever way the figures are interpreted though, there is no doubt that teacher training and integration of ICT is becoming a politically sensitive topic that demands further investigation.

Stoll, astronomer and IT critic, reasons that IT does more harm than good. He states, for example, "English teachers must deal with the cry for computer literacy while coping with semiliterate students … who can't read a book." (Stoll, 1999; xiii). Additionally, Campbell (1998) argues that current IT usage develops incompatible learning habits for the learner about to embark on a journey of lifetime upgrading of employment skills, "Information received is ordered, evaluated, and processed using reason, inference and logic" (p.24). The Digital Age has brought us hypertext and hypermedia where users leap from one page or medium to another. Such characteristics of the medium of learning, "creates individuals who make use of knowledge and facts in a non-sequential, random manner" (ibid).

Kompa, a lecturer and interactive media designer in Singapore, suggests that if IT is used as a panacea to solve educational woes and develop a community of digital literati then we are in for a shock. He succinctly comments, "The worst regress of all would be a single student learning from a pre-programmed machine. The model of the solitude learner is the most ineffective, conservative, old fashioned, non-communicative and idiotic of all learning models. The Greek origin of the word 'idiot' is 'idiocy' which means 'privacy.' An idiot is a person who enjoys so much privacy that he/she gets finally detached from the real world. A student trying to learn from a computer is therefore a poor idiot!" (Towndrow & Vallance, 2004; 82). Cuban (2002) uses similar emotive language to express his frustration of the tyranny of technical administrators who are often, but inappropriately, at the forefront of technological integration in education. Cuban's extensive research in ICT adoption concludes that educators need to change their pedagogy if technology is going to have any impact on students' learning, Quite simply, technologists are unsuitable and ineffective change agents of classroom practices.

Kraut, Lundmark, Patterson, Kiesler, Mukopadhay, & Scherlis (1998) additionally warn that young learners in particular are at risk if IT is used inappropriately and found that "…greater use of the Internet was associated with declines in participants' communication with family members in their household, declines in their social circle and increase in depression and loneliness." This is supported by Healy (1999) and Noble (1998) who state that IT is actually detrimental to developing any form of human interaction such as communication skills; a core component of Singapore's MP1.

In their observations of IT rich classrooms in China, Zhong & Shen (2002) state that, "it appears that a technologisized traditional classroom is emerging" (p.46). The teacher remains the expert having control over the students, the learning environment and the delivery of content in a pre-packaged electronic format. IT is merely added to the teacher's repertoire of skills with little emphasis on the benefits to the students' learning.

Finally, there may be a misalignment between use of ICT and what is examined at the end of the learning experience. This lack of curriculum validity prevents many educators from adopting ICT at any level. Some teachers go on to report that computer based integrative learning systems, "propound a model of learning to the learner which inhibits the development of attitudes, concepts and processes needed to become adaptive, creative and flexible learners" (Parr, 2003).

To conclude this section, it may be depressingly familiar to many teachers that to express doubt about the integration of IT is unwelcome. Such concerned educators can often be looked upon with disdain by their colleagues or institute administrators. Pavri (1998), a professor at the National University of Singapore, explains, "The IT culture is so pervasive that anyone suggesting that this new technology might have many deleterious effects is treated with scorn, even contempt" (p. 76). This portrays the computer society as inevitable and, in the process, suggests that any misgivings about it amount to nothing more than nostalgia. Pavri (1998) continues, "Add to this the fervent appeal to national prestige, along with a challenge to overcome our foreign competition, and it becomes hard to find anyone who will even admit the possibility that all this computer talk may be exaggerated" (p.81).

2.9 Summary

The literature on ICT integration and its impact on learning do not provide a clear picture. The analysis may imply that computer assisted learning is no more effective than other types of intervention (Parr, 2003). We have also seen that evaluation studies (research) often focuses upon students' reactions rather than learning outcomes, and on human-computer interaction rather than quality of learning. There is also little research in CMC communication between students. CMC does not provide an environment with its own unique intrinsic outcomes for teaching and learning, but offers a customisable stage that can be adapted for different purposes (Salmon, 2002). In addition, the technological developments and associated use of ICT (in and out of school) are currently in a state of constant change as emerging technologies appear (and disappear) on the commercial market. Consequently, due to the varying complexities of ICT and its utilisation, there needs to be continued research on 'informed use' to promote effective processes and positive outcomes in learning when using technology. The aforementioned literature has highlighted some key factors for informed ICT training in education, and has been categorized into four (4) characteristics that represent the key factors of informed learning. This represents a framework where the characteristics of activities, integration, collaboration and shared spaces are deemed necessary for teachers to adopt ICT in an informed way. The designed framework of this thesis (see Table 2.3. Key factors for informed ICT integration) has been found to be representative of the work of Selwyn (1997), and will be utilized as a foundation for the context of this Case Study research process.

2.10 The research question

The literature review has highlighted the benefits and concerns of adopting technology, in particular, to train teachers to use ICT in their teaching. It has been shown above that a number of factors are desired for effective utilization but this thesis takes the prognosis further: 'informed use' is desired for best practice of ICT by teachers with their students. The literature has thus led to a consideration of a research question within the context of Digital Age practitioners. The increasing student population in Higher Education, the proliferation of affordable computer-based technology, the demands of nation policy makers, the expectations of industrialists, parents and learners has led to research in Virtual Learning Environments (VLE) and Computer Mediated Communication (CMC). As such there is a demand that Higher Education introduces innovative approaches and structures that make use of ICT. The concurrent expectation is that of flexibility and student-centred learning enabled by emerging technologies. One emerging technology that blends a so-called Virtual Learning Environment with Computer Mediated Communication is synchronous networking applications such as iStorm and Marratech, where users can cooperate in the development of a single document across distance in real-time whilst simultaneously video-conferencing and text CHATting. It is proposed that by allowing trainees to participate in the utilisation of synchronous networking during an existing ICT-rich teacher training module, then such use may facilitate teachers to change their beliefs about teaching (e.g. from a didactic approach most experienced and most are trained to do, to student-centred, interactive learning). It is also anticipated that synchronous networking can be used to develop deeper understanding and facilitate critical discourse of difficult issues. Conventional teaching practice simply does not support such progressive technology (Deng & Gopinathan, 1999), thus pre-service teachers need to be exposed to ICT integration in a more constructivist pedagogy.

There is very little research in using synchronous networking as the technology has only recently become affordable and thus available (see Section 1.3 – Synchronous Networking Technology) so it is important to continually explore the relationship between aspects of ICT in educational contexts (BECTA, 2003; Knipe & Lee, 2002; Levy, 2003). To discuss synchronous networking effectiveness, the paradigm of informed tasks lead to related activities and, it is anticipated, learning. Types of learning will inform the literature in order to further explore effectiveness of synchronous technology in education contexts. As stated by Knipe & Lee (2002), it is also vitally important that the ICT under investigation not be the primary focus of the research but how the technology supports learning. BECTA (1998) states that,

> "To evaluate any use of IT, we need not only consider its impact on specific measures of learning but also assess the significance of the kinds of learning it supports in relation to the overall goals of education and teaching" (p.34).

The above considerations support Selwyn's four characteristics summarized as a proposed framework[24] for informed ICT teacher training in Table 2.4 - Characteristics to maximize the potential of ICT, above. The time is therefore ripe for research in emerging ICT such as synchronous networking technologies and its impact on the types of learning incurred. This thesis aims to address a particular research question that this literature review has revealed to be inadequately covered:

[24] See Table 2.3 – Key factors for informed use, for details of the proposed framework.

How does the use of synchronous networking technology impact on ICT integration by pre-service teachers?

CHAPTER 3 METHODOLOGY

3.1 Introduction

The purpose of this study is to demonstrate that an effective transformational strategy for pre-service teachers adopting technology can be facilitated by adopting synchronous inter-networked based tasks. The aim is to analyze the types of learning that take place during the use of synchronous networking technologies by pre-service teachers within Selwyn's framework of Activities, Integration, Collaboration and Shared Space for informed ICT integration and its subsequent impact upon the pedagogical beliefs of the trainee teachers. To undertake such research, a Case Study Research design is employed whereby a triangulation process of data is collected via quantitative and qualitative methods. This chapter justifies and details the research design, procedure and limitations. It is thus timely to recall the research question as derived from the Literature Review and then develop the rational for a Case Study approach: How does the use of synchronous networking technology impact on ICT integration by pre-service teachers?

3.2 Research Design

Case Study research design is most often employed to obtain, "an in-depth understanding of the situation and its meaning to those involved" (Merriam, 1988; xii). A Case Study can test theory or build theory, incorporate random sampling or purposive sampling, and involve collecting quantitative data or qualitative data. Guba & Lincoln (1981) suggest that qualitative and quantitative techniques employed in Case Study research can be used in combination and that such 'triangulation' enhances validity and reliability[25] of the study. It is recognised though that problems can arise if one is trying to reach consensus across studies conducted from the naturalistic and traditional research paradigms. For instance, a quantitative study must follow strict procedures in terms of data collection and analysis whereas a qualitative study needs to provide enough detail to illustrate how a

[25] Note that validity and reliability in this case study research are referred to as credibility, dependability, transferability and reliability. See Section 3.3 – Limitations, for a discussion of these terms.

conclusion makes sense. This is termed academic rigour. Merriam (1988) asserts that academic rigour is available in Case Study research;

> "Unlike experimental designs where validity and reliability are accounted for before the investigation, rigour in a qualitative case study derives from the researcher's presence, the nature of the interaction between researcher and participants, the triangulation of data, the interpretations of perceptions, and rich, thick description" (p.120).

In a further text, some ten years later, Merriam (1998) additionally asserts;

> "What makes the Case Study work 'scientific' is the observer's critical presence in the context of occurrence of phenomena, observation, hypothesis testing (by confrontation and disconfirmation), triangulation of participants' perceptions, interpretations and so on" (p. 200).

In effect, data needs to be presented as it emerges, and related to the participants' perspectives. Moreover, a Case Study approach does not claim any particular method for data collection and analysis and has thus been defined as, 'interpretation in context' (Cronbach, 1975). As such, a Case Study attempts to uncover the interaction of significant factors characteristic of the case (Merriam, 1988).

Schrum *et al.* (2002) and Yin (1994) state that a Case Study is particularly useful (a) to describe the details in depth, in a holistic manner, and from the perspective of the participants, and (b) describe the details from multiple data sources rather than employ statistical sampling. A Case Study is also particularly appropriate when the goal is to represent interaction, describe its context and explain the complex linkages involved in the interaction. Consequently, Case Study research design is particularly suited for studying educational innovations (Merriam, 1988) such as that characterised in this thesis.

Such 'research in action' may also be considered Action Research (AR); a systematic and collaborative effort aimed at solving classroom problems (Kemmis &

McTaggart, 1988). More recently though there has been less emphasis on the problem solving in AR and more on the teacher reflection as an attempt to understand their students and associated learning (Edge, 2000). This may be considered in tune with recent developments in English language teaching that emphasises a learner needs analysis prior to development of tasks to facilitate learning (Nunan, 1989). The process of this thesis research certainly caters to the implement-reflect-modify-implement cycle so illustrative of AR. The participants reflect, the instructor reflects, and the tasks are modified and implemented through an iterative process, with periodic outcomes recorded. As this research encompasses a triangulation of data (weekly surveys for quantitative data, interviews for qualitative data, and digital observation for confirmation (or otherwise) of both quantitative and qualitative data) it is more than AR. One may argue that AR or Case Study is simply a semantic consideration. However, it is believed that if this thesis was stated as Action Research the reader may bring his/her assumptions about AR which may negatively impact upon the reader's understanding of the digitally customised methodology being developed in this thesis.

To re-emphasise, this research is therefore conducted as a Case Study that will investigate the activities and cognitive outcomes within the context of synchronous inter-networking and the impact this has on the beliefs of informed ICT-usage by the teacher trainee participants.

3.3 Limitations

Valid Case Study research must allow for external judgements to be made about its procedures and outcomes. This has been referred to as a research's 'trustworthiness' and can be represented by four criteria: credibility, dependability, transferability, and confirmability (Guba & Lincoln, 1981).

3.3.1 Credibility

Credibility in research needs to ensure that the data and resultant findings are accurately identified and described (Guba & Lincoln, 1981). In an attempt to account for credibility in this Case Study, the participants' discussions and physical actions are captured by a digital camera attached to the top of the computer (see Figure 3.2 – Computer configuration). In addition, all user-defined computed actions displayed on the monitor are also digitally captured. The video and the screen capture are then synchronised into one digital movie format (see Figure 3.3 - Screen capture during task). Immediately after the task, the students discuss their activities and learning with the researcher using the survey form and initial three questions (see Section 3.7 - Instrument) to begin and contextualise the discussion. A summary of the discussion is then written and posted online (the researcher's Weblog/BLOG). This summary is made available to the participants within one week after the discussion so that they can verify and/or clarify any points personally (or by e-mail, if necessary). By involving the participants in this way it is anticipated that the acknowledgement that the task process and resultant interview transcriptions are accurate and satisfactory, will lessen any misinterpretation of meaning, and also attempt to account for any bias by the researcher. The opportunity to follow up a task's process, outcome and interpretations by participants and the researcher also helps contextualise the next focus group discussion three weeks hence. As the Case Study progresses the researcher will look back at previous transcripts of task processes and interviews in order to identify recurring issues, and then seek clarification from the participants at the later interviews. It is proposed that the cross-referencing of the digital capture, the post task interviews, the researcher's interpretation posted on the BLOG, and later follow up lend credibility to the recorded data.

3.3.2 Dependability

Dependability considers whether the Case Study process is consistent in its method over the duration of the research (Miles & Huberman, 1994). This has also been referred to as procedural dependability (Flick, 1998). In an attempt to account for dependability in this Case Study, all four synchronous networked task actions are digitally captured. Also, as mentioned above, discussions that occur in the process of the task implementation are digitally captured. All instances of verbal communication are transcribed in order to seek meaningful themes as the data evolves over the duration of the Case Study. The researcher also keeps a BLOG that represents informal notes and also formal interpretations of the task process and outcomes by referring to the activities and cognitive outcomes discussed with the participants and quantified from the quantitative data (i.e. the surveys). The BLOG is updated after each synchronous networked task and, as themes emerge from the data, the participants can further comment on the class Bulletin Board System (BBS). Moreover, in an attempt to ensure reliability of the transcriptions, all digitally captured tasks and interviews are transcribed in their entirety. This is made possible by the excellent audio and visual quality recorded directly into the digital format. Any low voices can be enhanced for increased clarity. Also, the same questions to begin each of the group discussions are repeated in an attempt to develop consistent yet emerging themes. To summarise, given the synchronised digital video and screen capture, the full transcriptions of all the task processes and the interviews, the good quality of the digital capture, together with the summarised written account of the group discussion on the researcher's BLOG, it is anticipated that the participants are able to clear up any doubts regarding misinterpretations or misunderstandings. This attempts to enforce dependability.

3.3.3 Transferability

Transferability considers how the results of the Case Study can be generalised or transferred to other contexts with different participants. To respond to a recognition that transferability may indeed be considered lacking in this Case Study research (due to the small and purposive sampling or the unique, innovative technological environment), detailed descriptions of the qualitative data are undertaken and then cross-referenced with the quantitative data. For example, in Task 2 the participants scored UNDERSTAND (i.e. understanding concepts, interpreting facts, analysing ideas and arguments) at 60%. By looking at the transcription for the task process and post task interview it was revealed that some participants had indeed expressed some understanding by the function and related exponents illustrated in Table 4.10 – Interview, and further expressed on the class BBS, as discussed in Section 4.3 –Task 2; for example, "I guess it's 'forced' upon younger teachers to use IT in our lessons and we use it for the sake of using without considering our roles or the students' roles. Now I understand the mechanics behind an IT lesson and will use it willingly without being forced into it." LAKSHMI

Such links between the quantitative data (i.e. the cognitive outcomes in the surveys) and the qualitative data (i.e. the related exponents tagged in the task process, the interviews and the BBS postings) are referred to often in the development of the discussion of findings in this Case Study (see Chapter 6 – Discussion of the Case Study research). The result is an emergence of themes which are categorised as generic, epistemic and declarative competencies. Cross-referencing occurs throughout the Case Study to help the researcher interpret participants' activities in the implementation of the task and the perceived cognitive outcomes.

Considering the participants, purposive sampling helps focus the research upon specific information that needs to be collected (Punch, 1998). In this Case Study research the emphasis needs to be on task implementation and participants' consideration of pedagogy, and less upon their technical competencies. By using purposive sampling a range of specific issues about networking technology and its facilitation of ICT integration and related practices can be collected as, given the student profile ICT training (see Section 2.5 – Preparing pre-service teachers to use ICT) and ICT-rich environment of the Singaporean pre-service teachers (as discussed in Section 2.2 – The Singapore context), it is anticipated that the sample students are informative about the concepts under study and are thus able to provide relevant and insightful information regarding these concepts. The students used in this study are final year trainees about to embark on a career in teaching. Language Arts (English) may be the subject context of the ICT usage but not all participants are studying English as their major subject (see Table 3.1 - Group Profile).

In summary, the Case Study research results are not intended to be considered in a traditional sense where these results may be applied, in this case, to all pre-service teachers in Singapore. This Case Study research seeks to understand what activities and cognitive outcomes take place in a digitally rich classroom undertaking tasks through the use of networking technologies (specifically synchronous networking technologies) that may impact on teachers' approach to ICT integration. It is thus proposed that by collating and describing the quantitative and qualitative data in detail from a purposive sample, judgements can be made about transferability.

3.3.4 Confirmability

The confirmability of a study refers to the bias of the researcher. In other words, the findings need to be the product of the focus of inquiry (Wettasinghe, 2002). Given that the researcher is also the instructor in the context setting, it is important to always be aware of researcher's bias and "the tendency to romanticise research of this nature" (Brown, 1992; 173). To overcome bias, the surveys after each of the four task based lessons are discussed within the focus groups in an open manner and not dictated by the researcher (instructor). The researcher begins each interview with predetermined questions to set the context. Thereafter, the interviewees are encouraged to openly discuss issues considered relevant to their personal experiences in this Case Study. Different opinions and interpretations are therefore encouraged and considered in the results. The participants were made aware of the fact that the instructor was also the researcher. It was therefore made explicit that any concerns or opinions expressed during the Case Study would have no impact upon their evaluation as BEd course students. By making this explicit at the very beginning, it was an attempt to encourage participants to freely judge the iterative SYNCH tasks and that the researcher, as course instructor, would not judge their contributions negatively. As a further safeguard, all course assignments and final exam papers were graded by a fellow lecturer, and moderated by the external BEd course examiner.

It is also anticipated that the quantitative data will display any glaring contradictions (if any) that may be made by the researcher's bias. Therefore, being open and aware of bias allows for a positive judgement of the study taking place. The Weblog/BLOG in particular reminds the researcher of potential bias. As the Weblog/BLOG is available online the researcher's supervisor and colleagues are invited to read and comment. Knowing that such a diary is in the public domain, the researcher strives to provide a fair and accurate interpretation of the data but also be open about a certain amount of bias that any researcher brings to a study. In conclusion, Locke, Spirduso & Silverman (1987) recognise that by being open about potential bias, a researcher's value and judgement is still useful and positive.

3.3.5 Other concerns

This Case Study may be interpreted as an intervention, where the researcher is trying to locate change, or indeed change, current practice by applying networking technologies and the aforementioned tasks. However, Brown (1992) highlights the concerns of sceptical researchers;

> "The argument is that successful interventions are a chimera or at least are extremely fleeting and fragile, not readily transportable to settings outside the innovator's control" (p.171).

In addition to the possibility of this research being considered an intervention, this Case Study may also, possibility, be considered a Design Experiment. For example, in her research Brown (1992) explains that her research team is, "trying to engineer in the classroom" (p.166). She wishes for, "improved cognitive productivity under the control of the learner… and with a theoretical rationale for why things work" (p.167). However, this Case Study is not attempting to 'engineer' learning or a different way of teaching, but observe and, with the students' participation, consider what is happening and why. Thus, it may be stated that although there may be a claim that this research is attempting to 'locate' change or 'engineer' change, the researcher does not wish to make such grand claims but present the research as a Case Study upon which further research such as an intervention in an authentic school setting conducted over an extended period can be considered given the findings from this thesis.

3.4 Triangulation

Quantitative data from surveys can support findings from qualitative data (Merriam, 1988) and "cast new light on field observation" (Sieber, 1982; 187). The use of this multiple method is known as 'triangulation' (Denzin, 1970), which is deemed a strength of Case Study research design (Merriam, 1988).

A qualitative approach is a valuable method to improve understanding of learning in adult education (Merriam & Simpson, 1984). Moreover, there is no 'established' research design or theory in the field of networking technology (BECTA, 2003; Levy, 2003). However Levy (2003), with reference to researching networking technology, has suggested a qualitative-based research approach in four distinct procedural phases; Phase 1: Planning action and research; Phase 2: Taking action- monitoring, reflecting, documenting; Phase 3: (Re)constructing, evaluating; Phase 4: Theorising, disseminating. These are discussed in some detail in the Procedure below (Section 3.6 – Procedure for collecting data). In addition, while a quantitative approach is concerned with outcomes, the qualitative approach is concerned with the process. Thus, the process of learning using networking technologies can be collated via qualitative data (e.g. discussions and digital capture) whilst their outcomes can be obtained via quantitative data (e.g. surveys). As such, the meanings expressed by the participants can play an important role in the development of the research. And as the research is both iterative and descriptive, the input influences the formulation of the development of the tasks and thus the associated activities and learning as the research period progresses.

The qualitative method will thus involve all participants reflecting upon and interpreting their own experiences in synchronous inter-networked tasks. In addition selected participants are also interviewed on four occasions immediately after their work on task is captured in digital format. These are referred to as focus group discussions. Such an approach supports what is termed by Levy (2003) as constructivist evaluation methodology;

> "In procedural terms, the emphasis is on cycles of dialogical interaction in which all participants – not only the researcher – are exposed to each others' viewpoints in order

to reach deeper understandings through critical engagement with multiple perspectives" (p.95).

In summary, in order to attempt to recognise any transformation in the pedagogical beliefs of the participants, this Case Study aims to be descriptive, allow for reflection, and thus reach an understanding through critical engagement.

The researcher will keep an online journal or Weblog[26] (in effect, a diary). Corti (1993) states that diaries can provide a reliable alternative and/or supplement to the traditional interview method as they provide a rich source of information on behaviour and experiences.

The quantitative method includes the participants' self report surveys. Participants report on classroom activities and cognitive outcomes based upon a Likert type scale (see Section 3.6 - Instrument). Also, open ended questions to encourage reflections of the learning process and transformation strategies will be included as it is vital that pre-service teachers become competent at evaluating and reflecting on the use of ICT in their lessons (Schrum *et al.*, 2002).

3.5 Sampling

There are two basic types of sampling: probability and non-probability (Punch, 1998). However, as generalisation is not the goal of Case Study research design (and this research), non-probability sampling is utilised. This is termed purposive sampling as the Case Study aims to gain an understanding and in-sights of the case (i.e. networking technology, activities, learning and beliefs). Therefore, the sample has to be chosen from which the researcher can learn most. Purposive sampling thus allows for an illumination of the questions being considered (Punch, 1998). For instance, the participants (final year teacher trainees) will have undertaken IT enrichment courses and taught lessons at Singapore's National Institute of Education (NIE) using technology prior to and during their previous semester's teaching practicum. By using such a sample the need to train participants in the technology is thus minimised so that a focus on the activities and

[26] See Vallance (2004) for a detailed discussion of Weblogs (commonly known as Blogging) as used by teacher trainees and English language learners.

learning is maintained in the focus group discussions. The participants thus consist of final year pre-service teachers (trainees) following a BEd programme at Singapore's National Institute of Education. The research is conducted during a course module entitled 'Computer Applications in Language & Literature' and the group (n=16) meet twice a week for 12 weeks (36 hours total class time). The total number of students in the final year is 97 whilst the participants in this research total 16. The group profile is shown in Table 3.1 - Group profile.

Number of responses					
	0-10 hours	11-20 hours	21-40 hours	41-100 hours	> 100 hours
How many hours have you taught at school?	0	1	1	8	6
Estimate how many hours formal IT training you have participated in.	8	5	0	2	1
	English	Maths	Science	Social science	Physical education
What subjects have you taught?	15	15	11	9	1
	A levels	Diploma	Degree	Post-graduate	
What are your academic qualifications?	8	7	1	0	

Table 3-1 Group profile

The formal IT training (above) was considered technical in content (such as Web page design with Microsoft's FrontPage, presentations with PowerPoint, and others). These were enrichment programmes that the students volunteered to attend. All students would have undertaken the compulsory 'Learning, Thinking and Instructional Technologies' and 'Computer-based Learning' modules in Year 2. Both modules are 36 hours each.

3.6 Procedure for collecting data

This study may be considered exploratory in so much as it does not lend itself to one particular research method. The study aims to explore the quantitative and qualitative data in a natural setting and obtain an understanding of the process and product of network based learning within the context of training teachers to integrate ICT. In effect, the conclusion is a narrative of how networking technology is used and how it impacts upon the beliefs of the pre-service teachers in their integration of ICT. The procedure for undertaking the research adopts Levy's (2003) four phases (as mentioned above):

Phase	Action	Interpretation
Phase 1	Planning action and research	This phase involves developing the research approach, investigation the field of action, designing pedagogic and technical models, and establishing a preliminary idea of participants' entry conditions
Phase 2	Taking action- monitoring, reflecting, documenting	This phase involves establishing the participative framework for the research, carrying out participant observation within the learning environment, cycles of dialogue with participants, and a reflective dialogue with a personal journal.
Phase 3	(Re)constructing, evaluating	This phase involves closing the online discussions and surveys, face-to-face conversations, and writing.
Phase 4	Disseminating	This phase involves a development of an understanding of what happened and the implications for ICT integration by new teachers.

Table 3-2 A qualitative-based research approach (Levy, 2003)

This procedure was chosen not only because of its utilisation within a similar research context (Levy, 2003) but is one that makes procedural sense having analysed the literature of qualitative data collection in Case Studies (summarised above). The thesis text at this juncture may be considered at Levy's Phase 1- Planning Action and Research. The resulting procedures for collecting quantitative data and qualitative data are illustrated in Figure 3.1 – Collecting the data.

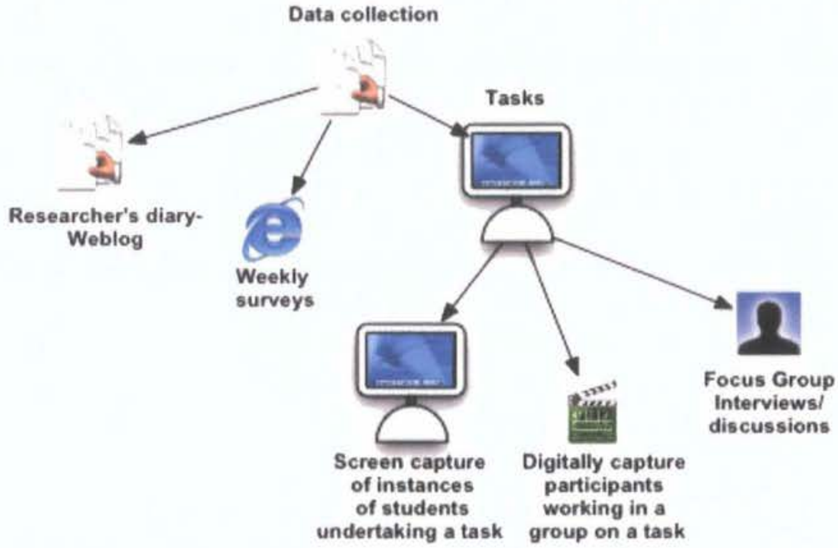


Figure 3-1 Collecting the data

In summary, the study follows the process of analysis of the quantitative data set collected after each lesson (i.e. the surveys) – what happened - and qualitative data analysis using the methods of field notes, data display, analysis and report – the interpretation of what happened (Miles & Huberman, 1984; Levy, 2003). This is discussed in the next section.

3.7 Instrument

The use of the multiple quantitative and qualitative methods is to increase the understanding of the utilisation of transformational technology to support teacher training from the participants' perspectives and responses to the tasks, associated activities and learning, and the networking technologies. During the research period all the participants complete weekly surveys which, as well as allowing them to reflect and interpret, also requires them to self categorise the inter-networked activities (such as receiving information, guidance, presentation, interaction, and others) and cognitive outcomes (such as memorising, constructing, consolidation, and values). See Tables 3.3 and 3.4 – Categorisations of activities and cognitive outcomes[27] - for an example of the students' and teacher data collection instrument.

[27] A complete interpretation and associated question for all categories is available in Appendix 1.

The first categories refer to CLASSROOM ACTIVITIES or how learning was organised in a lesson. This will capture the variety and quality of pedagogy. The low-inference judgements (Yes/ No) require acknowledgement of teacher led activities (such as giving information and explanations) to student centred activities (such as planning and group discussion). The second categories capture the different types of COGNITIVE OUTCOMES in order to highlight breadth and variety of cognitive demands in a lesson. These require participants' acknowledgement in a more subjective manner (a 6-point Likert scale). By combining activities and outcomes, an analysis of types of learning (such as independent, teamwork, communicative, and others) may be determined (Knipe & Lee, 2002).

The glossary of terms in Tables 3.3 and 3.4 illustrate the categories utilised by Knipe & Lee (2002) and adopted as an instrument in this Case Study. UNDERSTAND, VIEWPOINTS, CRITICAL, and OWN EXPLAN, represent declarative conceptual knowledge and applying such knowledge in problem solving or arguments. Goodyear (2001) calls this academic competence. TERMS, MEMORY, DECISIONS, CONSOLIDATE, NEW IDEAS, and CORE SKILLS are deemed generic competencies that are currently expected of graduates and are linked to what Goodyear calls 'transformative potential' which is essentially a willingness to learn. Given the rapid changes occurring in society due, in part, to technological advancements learners nowadays are required to be flexible in their use of knowledge. This is termed 'epistemic fluency' (Morrison & Collins, 1996) which may be represented in this Case Study by APPLIC, VALUES and CONNECTIONS.

CATEGORY	ABBREVIATION	FURTHER EXPLANATION
Receive information	INFO	Students receive a body of information where the emphasis is on terminology, facts and/or formulae.
Give explanation	EXPLAN	The teacher goes beyond factual knowledge to describe theories, interpret facts and/or analyse concepts.
Give instructions	INSTRUCT	Students are told how to complete a task.
Give guidance	GUIDE	Students are guided as they complete a task
Note taking	NOTES	Students take notes from the teacher
Working with notes	WORKNOTES	Students work through handouts or previously given notes
Reading	READ	Students read or study materials independently
Questions/ answers	QUESTION	Students and teacher engage in prolonged question and answer sessions
Group discussion	GROUPS	Students discuss topic in pairs or groups
Exercises	EXERCISE	Students complete set tasks, e.g. problem solving, worksheets, translations
Planning	PLAN	Students and teacher plan a task, e.g. homework, essay, project.
Working with IT	IT	Students work with IT
Working with equipment	EQUIP	Students work with lab equipment or tools
Working with materials	MATERIAL	Students work with materials, e.g. in lab or studio
Making presentations	PRESENT	Students present their work to other students for comment and feedback
Preparing for work placements	PLACE	Preparation for extended work placements, e.g. teaching practice
Revision	REVISE	Going over previously learned material
Other	OTHER	Any other type of activity not adequately described in the previous categories

Table 3-3 Glossary of terms for Activities

CATEGORY	ABBREVIATION	FURTHER EXPLANATION
Developing terminology	TERMS	Learning new terminology, becoming familiar with technical vocabulary
Ordering and memorising	MEMORY	Learning to structure, memorise and order well established information
Understanding	UNDERSTAND	Understanding concepts, interpreting facts, analysing ideas and arguments
Alternative viewpoints	VIEWPOINTS	Learning about alternative theories or points of view on the same subject
Consolidation	CONSOLIDATE	Consolidating previously learned materials
Producing new ideas	NEW IDEAS	Generating and combining new ideas through questions, discussion and brainstorming
Critical evaluation	CRITICAL	Learning to be critical, to question evidence and/or assumptions and to evaluate arguments
Constructing own explanation	OWN EXPLAN	Learning to construct own explanations
Problem solving	PROBLEM	Developing methods and strategies for solving problems, e.g. defining problems, considering alternatives solutions

Mastering skills- general or core	CORE SKILLS	Learning IT, communication, application of number skills, info retrieval
Decision making	DECISIONS	Learning about decision making, considering options, weighing up the pros and cons of different options, deciding on the best course of action
Applying theory to practice	APPLIC	Learning to relate theoretical knowledge to own experience, to applications and /or to specific examples
Values	VALUES	Identifying the values underpinning areas of enquiry, developing a sense of own values
Other	OTHER	Any other type of cognitive outcome not covered by previous categories
Connections	CONNECTIONS	Making connections to the workplace.

Table 3-4 Glossary of terms for Outcomes

The collated Activities and Outcomes survey form is illustrated in Table 3.5 below. This is the survey form that the students receive after each lesson.

Classroom activity page	YES/ NO Whether activity took place		Intended cognitive outcomes. To what extent did the following apply in this session?	Extent to which they took place					
INFO	YES	NO	TERMS	0	1	2	3	4	5
EXPLAN	YES	NO	MEMORY	0	1	2	3	4	5
INSTRUCT	YES	NO	UNDERSTAND	0	1	2	3	4	5
GUIDE	YES	NO	VIEWPOINTS	0	1	2	3	4	5
NOTES	YES	NO	CONSOLIDATE	0	1	2	3	4	5
WORKNOTES	YES	NO	NEW IDEAS	0	1	2	3	4	5
READ	YES	NO	CRITICAL	0	1	2	3	4	5
QUESTION	YES	NO	OWN EXPLNATION	0	1	2	3	4	5
GROUPS	YES	NO	PROBLEM	0	1	2	3	4	5
EXERCISE	YES	NO	CORE SKILLS	0	1	2	3	4	5
PLAN	YES	NO	DECISIONS	0	1	2	3	4	5
IT	YES	NO	APPLICATION	0	1	2	3	4	5
EQUIPMENT	YES	NO	VALUES	0	1	2	3	4	5
MATERIAL	YES	NO	OTHER	0	1	2	3	4	5
PRESENT	YES	NO	CONNECTIONS	0	1	2	3	4	5
PLACE	YES	NO							
REVISE	YES	NO							
OTHER	YES	NO							

Table 3-5 Categorisations of activities and cognitive outcomes (adapted from Knipe & Lee, 2002)

Several characteristics of learning will be analysed. These characteristics will be contextualised under 'breadth of learning' where activities and cognitive outcomes are discussed and utilised as 'markers' to locate qualitative data and interpret the relevance to a participants' competency or, possibly, change in pedagogical beliefs. First, the pedagogy will be evaluated by the frequency and variety of classroom activities reported. The wider the variety of activities (which will be an indicator of breadth of learning), the higher the quality of pedagogy. Secondly, the cognitive demand will be evaluated by the frequency and variety of types of cognitive outcomes. The wider the variety of cognitive outcomes (which will be an indicator of breadth and shift in cognitive demand during a session), the higher the quality. Finally, students' development of learning strategies will be evaluated. The higher scores across a wide range of activities will illustrate that independent strategies are being adopted (McEwen, McGuinness, & Knipe, 2001).

Goodyear (2001), in his paper discussing psychological foundations for networked learning (synchronous and asynchronous), presents Schuell's (1992) models of learning as best representing the research in cognitive psychology. The first three are considered quite common in Higher Education contexts but the last model (Learning as guided construction) represents a constructivist approach to learning in educational contexts (Jonassen *et al.*, 1999).

Learning	Description
Learning as passive reception.	This implies that knowledge can be broken into discrete chunks that can be transferred from teacher to learner.
Learning as discovery.	Learners build unique understandings through personal journeys of discovery.
Learning as knowledge deficit and accrual.	The acquisition of knowledge by the novice from the experts. Less attention is paid to process of acquiring the expertise.
Learning as guided construction.	Resembling the discovery approach, learners are given an active part in constructing meaning but are guided by external sources and/or self reflection.

Table 3-6 Schuell's model of learning

Goodyear (2001) then continues to describe 'good learning' and the need for a design model that that will improve the success of networked learning outcomes. He describes 'good learning' as a "guided process of knowledge construction" (Goodyear, 2000), that is supported by five learning characteristics;

Learning	Description
Learning is active.	To make new information meaningful, purposeful and personal, learners must carry out a variety of cognitive processes.
Learning is cumulative.	A successful learning event draws upon the learner's prior knowledge in order to make sense of the new information.
Learning is individual.	No two learners have the same experiences and knowledge.
Learning is self-regulated.	Learners need to be aware of their own learning through periodic reflection and adjust their approaches to facilitate the acquisition of new knowledge.
Learning is goal orientated.	Learning outcomes need to be made explicit by teachers and/or the learners.

Table 3-7 Goodyear's characteristics of 'good' learning

Schuell's models of learning and Goodyear's characteristics of 'good' learning help build a coherent model of a networked learning system that can increase the chances of improving learning outcomes. This is confirmed by Goodyear (2001);

> "We are likely to have greater success in improving networked learning outcomes if we design in accordance with a model that emphasises the five characteristics of learning" (p.59).

These characteristics are taken into account during the iterative task design within the synchronous networking context and discussed in detail pertaining to each task in Section 3.8- Tasks. In addition, in attempting to discuss the 'breadth of learning' that was revealed by the quantitative data (see Chapter 5 – Case Study Research and Findings: Quantitative Data) Schuell's four models of learning and Goodyear's characteristics of 'good' learning will be referenced.

While the students are working on each of the four tasks, all their computer actions on screen are recorded using specialised software (Snapz Pro X). Also, an iSight video-conference camera atop the computer captures all of their movements and communication. The camera is fitted with a wide-angle lens (Vitacon M-Power) to ensure all students working around the computer screen on task are captured(via QuickTime Broadcaster). The microphone built into the camera is also set to its highest sensitivity and maximum quality. Figure 3. 2 - Computer configuration, shows a networked computer being utilised in this research. Figure 3.3 - Screen capture during task, illustrates a captured image from a digital movie of students working on a synchronous networking task. This will provide data to support (or otherwise) reflections and interpretations discussed in the interviews and typed on the BBS. Also, the strengths and weaknesses of the task process by the participants can be tagged for consideration when improving the following tasks. The digital capture will also lend credibility to the recorded qualitative data (see Section 3.3- Limitations).

Figure 3-2 Computer configuration

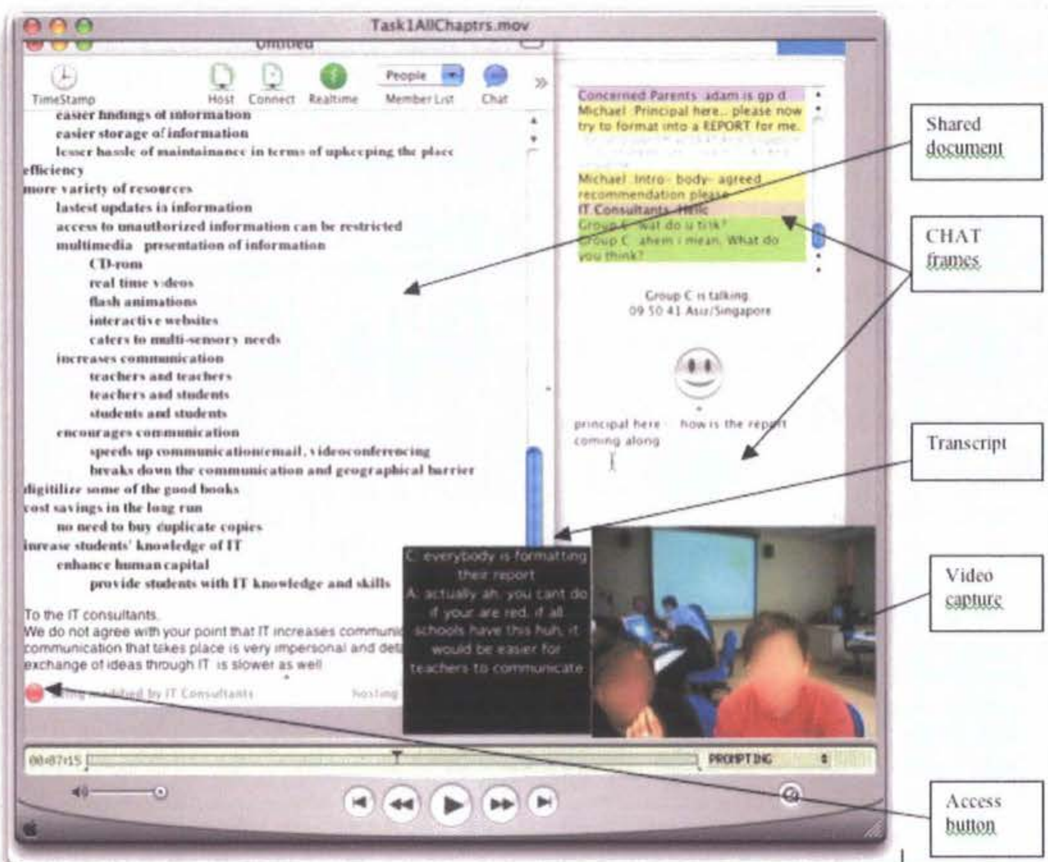


Figure 3-3 Screen capture during task

Further cross referencing on the impact of the synchronous inter-networked activities is undertaken by interviewing participants. At four (4) instances during the course, three (3) students are selected to participate in a focus group discussion about the lesson's activities and learning within a network technology rich context. The structure of the discussion questions generally fall into two distinct categories: opinion or value questions, and knowledge questions. Opinion or value questions aim to find out what the participants think about the activity, the learning and, in this case, the technology. Knowledge questions aim to find out what participants consider to be factual information regarding the research topic; in this case, learning and technology (Patton, 1980). In asking these questions the researcher needs to be aware of interview bias, that is, affecting what is being investigated. To overcome this the researcher in this Case Study begins each focus group discussion with the following three questions:

1. How did you do the task?
2. What activities do you think were used to do the task?
3. What learning do you think was used to do the task?

This aims to contextualise the immediate experiences and develop a clear focus at the beginning of the discussion. Moreover, prior to the discussions the focus group participants will have read the researcher's Weblog[28] (known as a BLOG) online in which interpretations of previous discussions are available. This not only allows for clarification but develop a comfortable environment upon which to share and build experiences and trust, respectively. Consequently, it is anticipated that the participants will progress from opinion-biased answers to more informed, knowledge-biased responses as they experience synchronous networking tasks, and reflect upon their experiences.

As the research is exploratory, the discussions help formulate activities and discussion questions for the following focus group meeting. The discussions are also used to encourage other issues not immediately raised through the survey forms and researcher's observations. As themes emerge from the cross-referenced quantitative and qualitative data, a Case Study report is constructed.

In addition, a BLOG written by the researcher is developed based upon the aforementioned quantitative survey and qualitative self reflection discussions. Tables 3.8 and 3.9 illustrate the surveys used to focus the researcher on the activities and learning observed (or attempted to be taught). The researcher's Weblog is developed from the self-reported survey data.

[28] A Weblog (commonly known as a Blog) is basically an online diary. This is updated weekly by the researcher and accessible to all participants. The Blog was online at http://homepage.mac.com/mvallance

TEACHER DIARY PAGE *Date:* *Duration of lesson:*

Classroom activity categories Which of the following classroom activities took place during the lesson/session? Refer to glossary	Yes/No Whether activity took place		Intended cognitive outcomes To what extent did the following figure in this lesson? Refer to glossary.	0 1 2 3 4 5 Extent to which they took place					
INFO	YES	NO	TERMS	0	1	2	3	4	5
EXPLAN	YES	NO	MEMORY	0	1	2	3	4	5
INSTRUCT	YES	NO	UNDERSTAND	0	1	2	3	4	5
GUIDE	YES	NO	VIEWPOINTS	0	1	2	3	4	5
NOTES	YES	NO	CONSOLIDATE	0	1	2	3	4	5
WORKNOTES	YES	NO	NEW IDEAS	0	1	2	3	4	5
READ	YES	NO	CRITICAL	0	1	2	3	4	5
QUESTION	YES	NO	OWN EXPLAN	0	1	2	3	4	5
GROUPS	YES	NO	PROBLEM	0	1	2	3	4	5
EXER	YES	NO	CORE SKILLS	0	1	2	3	4	5
PLAN	YES	NO	DECISIONS	0	1	2	3	4	5
IT	YES	NO	APPLIC	0	1	2	3	4	5
PRESENT	YES	NO	VALUES	0	1	2	3	4	5
REVISE	YES	NO	OTHER	0	1	2	3	4	5
OTHER	YES	NO	CONNECTIONS	0	1	2	3	4	5
COMMENTS?			COMMENTS?						

Table 3-8 Teacher's weekly survey

The collated data is compared to the students' data. This is discussed in Chapter 5 – Case Study Process and Findings: Quantitative Data.

Teacher review of the week

Learning to learn: refers to the knowledge which students acquire about their own learning habits and strategies and how they organise themselves as learners. This section attempts to find out how successful students were in doing this.

Looking back over the week's activities in the classroom, on a scale of 0 – 5 to what extent do you feel the students learned the following?

0 = not at all *5 = to a very large extent*

Students' learning	0 1 2 3 4 5					
Sources of information; learning to find and use sources of information, e.g. books, libraries, people, CD-ROMS, the Internet, etc	0	1	2	3	4	5
Planning and self monitoring; learning about planning and monitoring own progress, time management	0	1	2	3	4	5
Independent learning; learning to take initiative, to make judgements, and to direct own learning	0	1	2	3	4	5
Feedback; learning how to receive and use feedback from the teacher and/ or other students	0	1	2	3	4	5
Confidence; gaining confidence in themselves as learners	0	1	2	3	4	5
Working as a team; learning how to work as a member of a group	0	1	2	3	4	5
Communication; developing communication skills in speaking and writing	0	1	2	3	4	5

Table 3-9 Teacher's diary

The diary form is completed after each lesson as this provides a consistent focus for the researcher. The data is not collated quantitatively as it was felt there was little to compare the data. However, the data from this diary provides a context upon which to reflect upon the progress of this Case Study. It is important that a consistent instrument is used by the researcher due to the other teaching and administrative demands of a university instructor. The recorded reflections are then summarised and reported in the researcher's weekly BLOG.

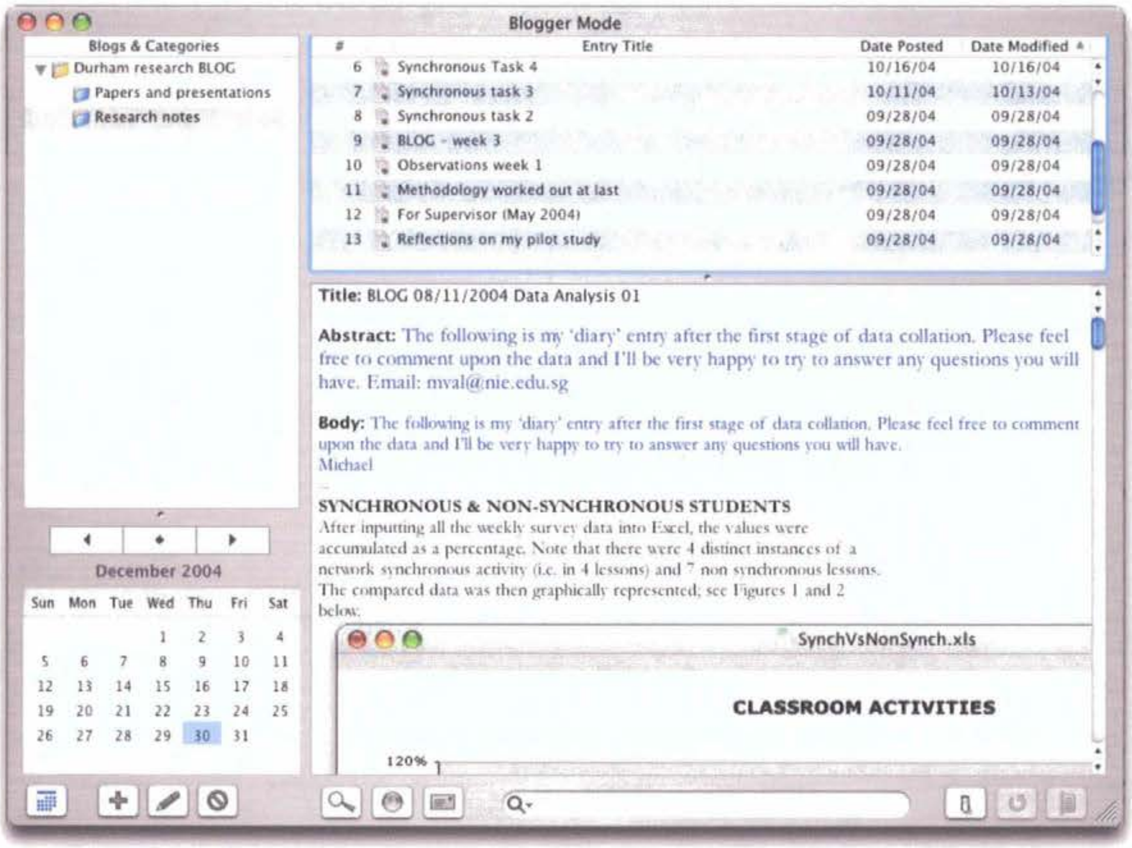


Figure 3-4 Researcher's BLOG

In summary, the mixed methods approach adopts surveys to collect quantitative data from all participants and the teacher, and qualitative data from selected focus groups in the form of capturing tasks and a discussion of related activities and learning undertaken. The researcher also keeps a weekly Weblog for viewing by all participants. In addition, all the participants register on the course BBS in order to post comments on the tasks, the interviews, the surveys, the researcher's Weblog, the issues of technology and learning, as well as questions and comments related to the course. In summary, data is collected in two ways;

Data collection	Procedure
Quantitative	• Survey form focussing upon activities and learning
Qualitative	• interviews/ discussions to support learning • screen capture and digitally capture students to confirm (or not) that expressed in quantitative surveys • researcher's reflections as a Blog for feedback from participants and colleagues worldwide

Table 3-10 Data collection procedure

The quantitative and qualitative data collection procedures are represented graphically in Figures 3.5 – Quantitative data collection procedure, and 3.6 – Qualitative data collection procedure.

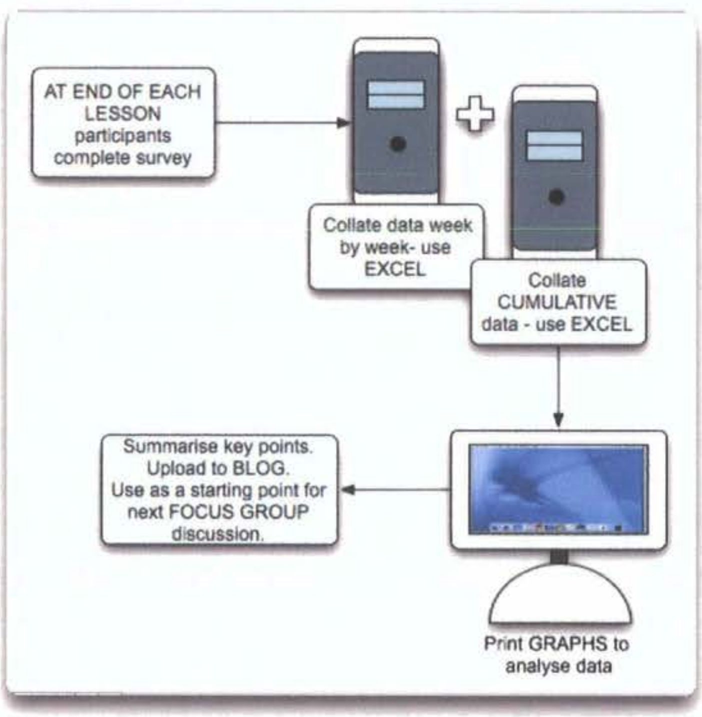


Figure 3-5 Quantitative data collection procedure

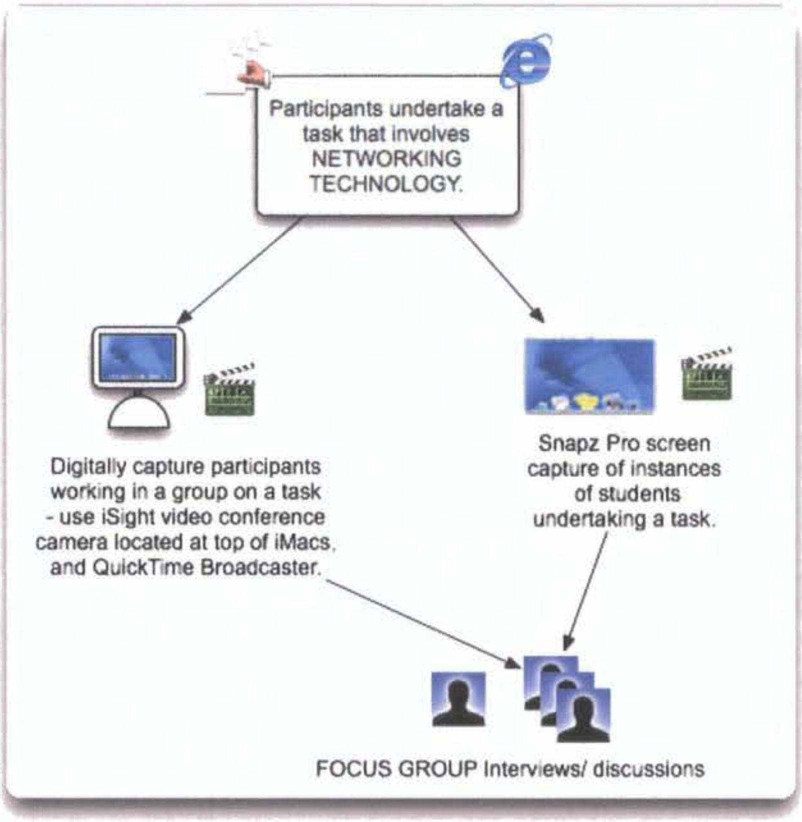


Figure 3-6 Qualitative data collection procedure

3.8 Tasks

Having established how the data is collected- quantitative and qualitative- it is timely to discuss the tasks that are utilised to facilitate this process. As stated in the Literature Review, the tasks incorporate the use of synchronous networking technologies adhering to Selwyn's framework of Activities, Integration, Collaboration and Shared Space (see Chapter 2, Table 2.4 – Characteristics to maximise the potential of ICT). For effective use of ICT, learners need to be provided with opportunities to cognitively engage with the materials with, "high levels of learner control" (Steeples, Jones & Goodyear, 2000; 328). Throughout the tasks in this Case Study the participants will therefore be provided with a context, and an achievable objective but the process of the task and thus associated learning path will be flexible. In other words, how the task is achieved will be determined by the networked students.

The research is conducted during a regular Bachelor of Education (BEd) course entitled 'Computer Applications in Language and Literature' and conducted in a digitally rich classroom with 34 networked computers and a variety of networking software and utilities; of particular importance for this research are iStorm, the Safari Web browser, the Bulletin Board System, TextEdit, Inspiration 7.5, QuickTime 6, QuickTime Broadcaster, Snapz Pro X, and Apple Remote Desktop (see Figure 3.7 – Digital classroom).

Figure 3-7 Digital classroom

Tasks during the course are undertaken in pairs, groups, and virtual sub-groups; the physical layout of the digital classroom plus the Apple Remote Desktop configurations can facilitate this. The course does not develop technical skills per se but focuses upon the application of ICT (theory, historical perspectives, pedagogy, practice, procedures, etc.) in order to encourage and develop students' understanding of informed use through an experiential learning process (as opposed to the didactic approach often employed (see Section 2.6. The challenge of ICT integration)). All work undertaken by students is posted on the class BBS for sharing and asynchronous discussion. The course outline is available in Appendix 12. How it conforms to Selwyn's framework is exemplified in Table 3.11 - Selwyn's framework applied to the 'Computer Applications in Language and Literature' course.

Characteristic	Explanation	Example from the course
ACTIVITIES	Teachers should offer students self directed learning activities that encourage self expression.	Digital scepticism. Students to seek information to critique the expenditure on technology in schools. Learned critics such as Healy, Stoll and Cuban provide a case for questioning the blind faith in IT investment. Students are expected to offer opinions backed with facts and personal experience.
INTEGRATION	Teachers are more effective after receiving extensive training in the integration of technology with the curriculum.	Expository writing. Students to use IT to plan an expository writing essay such as 'Mobile phones cause cancer' using the KWL (Know-Want to know-Learned) approach. IT is used at all three levels of KWL.
COLLABORATION	Small group collaboration on computer is especially effective when students have received training in the collaborative process.	A jigsaw activity. Students are expected to complete a presentation on educational policy trends. Each student is given some information (a country's education policy fact sheet online) and need to seek further understanding. Later, all students gather to seek commonalities and trends in worldwide educational policies that incorporate IT in some form.
SHARED SPACE	Exemplary computer using teachers benefit from a social network of other computer-using teachers at their school.	The class BBS is available 24/7. Students are designated moderators for the discussion threads with the aim of developing key points raised in class. Going beyond enforced collegiality, the BBS is a place to express concerns and advice no mater how important or trivial. Over the semester a shared community develops.

Table 3-11 Selwyn's framework and the 'Computer Applications in Language and Literature' course

In addition to the weekly surveys, throughout the 12-week course there are four instances when data is collected while students are undertaking a task using synchronous networking technology. As previously stated, the students work is captured digitally; a) what they do when using the computer (screen capture) and b) what they do while working (video and audio capture). Immediately after this task a focus group is formed in order to discuss the task with the researcher. Each task requires a context and this is best illustrated in the four related lesson outlines in Appendix 12. How each task conforms to

Selwyn's framework is illustrated in Table 3.12 - Selwyn's framework and 'Computer Applications in Language & Literature' course tasks.

Characteristic	Explanation	Task 1 The report outline	Task 2 The expository essay	Task 3 The idiom	Task 4 The narrative
ACTIVITIES	Teachers should offer students self directed learning activities that encourage self expression.	The students are given roles and respond accordingly. Students are provided opportunities to express their opinions but in Task 1 their contributions are influenced by their assigned roles.	Students are provided with the opportunity to choose an essay title from a selected list and then a particular role to express viewpoints. Task 2 is more flexible than Task 1.	Students are provided with an idiom and can offer any context and personal interpretation. Task 3 is considered flexible in terms of the activity's process and product.	Flexible learning encouraged. Students are provided with 5 pictures and then decide a language exponent from the English curriculum and use ICT to promote their and their learners' uniqueness
INTEGRATI ON	Teachers are more effective after receiving extensive training in the integration of technology with the curriculum.	Integration of technology through formal text development, informal text discussions and linking both with the reporting structure being a key genre of the English syllabus.	Use of IT to develop a lesson that integrates IT in the construction of an expository lesson outline. In addition, use of organisation software and Web searching strategies combine to support student to student collaboration.	Task is customised for students to offer independent opinions based upon out-of-school experiences (for the context and interpretation of the idiom). ICT supports the interactions. In the construction of idiom's meaning and use.	Graphic images offer students an opportunity to order, interpret and develop meaning within the images, and also their linkage. Multi-modality combined with ICT for communication facilitates an open ended task.
COLLABOR ATION	Small group collaboration on computer is especially effective when students have received training in	Students work on text in real time whilst developing ideas in CHAT frame informally.	Each student is unique in their experience using IT for teaching. Using real time, remote technology to develop an essay outline normally undertaken	Students from different school sectors and even levels (Primary and Secondary) can work together. Different	Each group has a different picture so all need to combine and then re-interpret the images to form the final outcome.

	the collaborative process.		individually, on paper, provides a unique experience in collaboration.	information needs to be combined for successful completion of the task.	
SHARED SPACE	Exemplary computer using teachers benefit from a social network of other computer-using teachers at their school.	All report contributions from varying roles being developed can be viewed by any student. Follow up promotes sharing of process and outcome.	Team development of an essay outline using real time communication. The IT used can form the platform from which to integrate IT with learners. Lesson output then shared on BBS for use by all, plus opportunities for follow up post lesson discussions and refinements	Primary and Secondary student teachers provide input as contexts and interpretations may differ. Agreed upon idiom meaning and use to be used in schools. Can re-develop during in-service period via BBS later.	All pictures can be re-ordered in iStorm by any user which thus effects the story and its development. The outcome can be posted to a BBS for others to offer different interpretations, peer review and use in class.

Table 3-12 Selwyn's framework and Computer Applications in Language & Literature course tasks[29]

It must be noted at this juncture that Tasks 2, 3 and 4 are a result of this Case Study research and were thus designed in conjunction with the participants. This is detailed in Chapter 4 – Case Study and Findings: Qualitative Data.

3.9 Ethical considerations

All participants were required to complete a consent form; this was customised for the local context as participants over the period of the 12-week Case Study were being video taped during the tasks. Also, participation in the research was not compulsory and even though conducted during a regular course, those who did not wish to participate did not need to complete the surveys or form part of the focus groups. All students kindly agreed to be participants. The quantitative survey data contributions were anonymous. However, as the Case Study was undertaken during a regular BEd course, the Bulletin Board

[29] Refer to Appendix 12 for detailed lesson outline for the Tasks

System (BBS) postings tagged the participants' login name. Therefore, the qualitative data in the form of interviews and BBS postings are not truly anonymous; the participants' login names were utilised but not their full, given names. This was the result of negotiation with the participants, and such negotiation made them feel comfortable and agreeable to participation in this research; remembering again that the Case Study was conducted during a high-stakes BEd course. Finally, summaries of the tasks and the captured digital movies were presented for discussion and clarification in order to check for any misrepresentation of the comments made by the participants. Again, all students agreed to be video-taped during the SYNCH tasks and interviews. However, their images in this thesis have been silhouetted and the video capture has been deleted from the digital movie files in the Appendix.

3.10 Pilot studies

A pilot study using the surveys was completed on a similar group of students from January to April 2004. The researcher instructed one group while a colleague instructed a second group. The purpose of the pilot study was to ensure that the surveys, instructions, tasks and technology were structured so that this research study could be conducted efficiently and effectively. Specific attention was paid to reducing the technical issues that arose periodically; e.g. network loss, slow computer response speed, interface design, capturing of screens and digital video, and format of archived digital content for retrieval. The surveys were presented at the end of each week and completion was voluntary. The response rate in both classes was low as the students may not have initially given much value to answering the related questions that focussed upon their immediate classroom experiences. Midway through the course though, the topic of 'informed use' highlighted the need for reflective practices by teachers. The response rate thereafter improved as the survey presented a convenient way for students to formulise their reflections, and thus provide evidence to the course lecturer in charge that they were indeed reflecting. Moreover, time was provided in class for completing the surveys and posting comments on the class BBS. One Activity category in Knipe & Lee's original survey form was changed from Project to Place. This was undertaken as the course did not include project work but did emphasise the application of theory and practice to the trainees' eventual workplace (i.e. their schools). In addition, a number of tasks using synchronous and non-synchronous network technologies and the instructions, procedures and contexts were discussed with students. Their feedback helped better develop the tasks so that the emphasis would be on the learning and teaching and not focus users predominantly upon the technology.

In addition to a trainee teacher course being used a s a pilot study, a second, parallel pilot study was used to test the usefulness of Knipe & Lee's (2002) survey in a non-synchronous technology context. The two groups of students upon whom the survey was utilised were Chinese teachers of English teaching Chinese learners of English online, facilitated by a common BBS. An account of the activities and learning that took place on the pilot study has been published. Three significant conclusions were found and are summarised below:

1. The most significant outcome of the study is the evidence that displays a large disparity of what the teachers thought they taught and what the learners stated they learned. It appears that the learners gained much more cognitive value from online interaction and the digital resources provided. Also, teachers underestimated their effect on the students' learning;
2. Teachers integrating IT in their teaching are fully aware of the need to change their roles as experts and transmitters of knowledge. However, the results reveal that the discourse features of communication between teachers and students will need to change to expect any level of using IT in an informed way to meet the needs of learners that are becoming increasingly IT literate;
3. Through the interactions all teachers and learners were considered to have participated in knowledge-building discourse (Scardamalia & Bereiter, 1996). It is anticipated that further opportunities for online interaction will lead to a better understanding of the English language for both groups of students. It is thus recommended that a future course involving teachers and learners of English include early on an explicit focus on communication skills and associated functional language exponents. This will set the tone and expectations for good language use and effective communication strategies (Vallance, 2005).

The two pilot studies re-affirmed the use of Knipe and Lee's survey to measure types of learning, and also helped prepare the tasks and the classroom environment to best facilitate synchronous networking.

3.11 Summary

The purpose of this study is to observe whether an effective transformational strategy for pre-service teachers adopting technology can be facilitated by synchronous inter-networked based training. Given the nature of the research, a Case Study research design has been adopted. This chapter has detailed the research methodology, highlighted the appropriacy of using Case Study research design, detailed the procedure and instrumentation adopted, and discussed some limitations that need to be taken into account. The main considerations that are adopted in this Case Study research are thus summarised in Table 3.13 below.

Consideration	A summary of the consideration	Literature reference	Located in this thesis
Characteristics for ICT integration	For informed use of ICT the learning environment and associated tasks should consider the characteristics of an activities, integration, collaboration, and shared spaces framework.	Selwyn (1997)	Section 2.7
A representation of good learning	The tasks need to be constructivist in so much as the participants are guided to construct meaning through critical reflection. The learning is expected to be active, cumulative, individual, self-regulated, and goal oriented as learners build understanding through personal journeys of discovery; facilitated by weekly surveys, BBS postings, interviews and the researcher's BLOG.	Schuell (1992) Goodyear (2001)	Section 3.7
Good task design and subsequent informed use	The main criteria for good task design by the participants in this research are • promote attention to meaning, purpose and negotiation • draw objectives from the communicative needs of learners • allow for flexible approaches to the task, offering different routes, media, modes of participation and procedures • allow for different solutions depending on the skills and strategies drawn on by learners • involve learner contributions, attitudes and affects • be challenging but not threatening to promote risk-taking	Selwyn (1997) Candlin (1997) Towndrow & Vallance (2004)	Section 2.7 Section 3.8

	• heighten learners' consciousness of the process and be reflexive Informed use is taught during the course as participants (the teacher trainees) reflect upon their integration of tasks.		
Procedure for networking technology research	Levy's recommended 4 phases procedure is adopted: planning action; taking action; (re) constructing, disseminating. This offers clarity in the procedure of Case Study research design.	Levy (2003)	Section 3.6
Instrument for collecting data	Knipe & Lee have conducted research using networking technology. Their instrument was evaluated for appropriacy during 2 pilot studies prior to this Case study research. Due to the survey components of ACTIVITIES and COGNITIVE OUTCOMES allowing the participants to consider a number of issues, the instrument facilitates a reflection process to build an understanding of the tasks undertaken and to qualify their changing beliefs of ICT facilitated pedagogy and learning.	Knipe & Lee (2002) Vallance (2005)	Section 3.7 Section 3.10
Case Study research design	A triangulation of data collected over a period of 12 weeks during a regular BEd course module that involves the researcher becoming involved in the research in action. As the iterative process of task design and teacher development unfolds, the quantitative and qualitative data collected provides evidence of a process and an outcome of change of teaching beliefs that are facilitated by synchronous networking technology.	Merriam (1988)	Section 3.2 Section 3.4

Table 3 -13 Summary of major considerations in the development of this Case Study research

Chapter 4 CASE STUDY PROCESS AND FINDINGS: QUALITATIVE DATA

This chapter highlights the key findings from the qualitative data collected during the Case Study research. This represents one node of a triangulation of data collected that was cross-referenced for the analysis that considers the impact on synchronous networking technology on the pre-service teachers in this Case Study. The qualitative data consists of digital capture of trainees working on synchronous networking tasks, post task interviews, and Bulletin Board submissions. As such, this chapter details and discusses the iterative process that led to the cooperative creation and informed integration of synchronous networking technology based tasks; as presented in Section 2.7 – Characteristics of informed ICT integration.

4.1 Introduction

Recall that this Case Study was iterative in its implementation. In other words, each corresponding synchronous task was designed based upon the discussions and reflections of the students undertaking the previous synchronous task. The discussions were in the form of live, digital capturing of students working on a task (both application action and students' communication were digitally captured), and reflections in the form of post task interviews and Bulletin Board submissions. This is considered Levy's Phase 2: *Taking action- monitoring, reflecting, documenting* (see Section 3.6- Procedure for collecting data). As the process unfolds, Levy's *(Re) constructing and evaluating* (Phase 3) emerges in the latter portions of the Case Study and is discussed in this QUALITATIVE DATA chapter and the following QUANTITATIVE DATA chapter.

To provide an opportunity for students to qualify why they ticked YES or NO for ACTIVITIES and OUTCOMES, the researcher interviewed at least two students together after the synchronous tasks. The comments provided a focal point for the quantitative data analysis and also to view the captured student actions and on-task discussions to confirm (or otherwise) the students' comments. Later, the reflections from the participants were analysed using the survey categories within the previously discussed (see Section 3.7 – Instrument) competencies profile: generic, epistemic, and academic.

At this juncture the procedure of the Case Study from Task 1 through and beyond Task 2 is detailed, The development of Tasks 3 and 4 can then be summarised based upon an understanding of the previous procedures. Note that the four synchronous Tasks utilised in this Case Study are summarised in Table 3.12 - Selwyn's framework and 'Computer Applications in Language and Literature' course tasks, in Chapter 3 - Methodology, and detailed lesson outlines are available in Appendix 12. The penultimate section of this chapter revisits the feedback from the participants after all the tasks had been completed. This was undertaken in order to search for an emerging discourse that could be sorted into distinct categories. Finally, an illustrative 'map' of the Case Study research can be found in Appendix 14. This foldable diagram offers a bird's eye view of the 12-week study.

4.2 Task 1

The first synchronous networking task involved four groups of students at remote locations. Their task objective was to create an outline for a school report on IT upgrading in the library. Each group was assigned a role: IT coordinator, English teacher, librarian, parents. Each role had certain qualities (e.g. enthusiastic, pragmatic, sceptical, concerned). The instructor[30] acted as network moderator and took the role of the neutral school Principal. The learning objective was to use the language exponents of negotiation and decision making. The learning skills were functional: to collaborate, discuss, negotiate, and make decisions. The lesson outline is in Appendix 12.

At the beginning of the lesson, the groups were given time offline to formulate ideas and establish a stance. They needed to ensure they were clear about the key issues that they considered relevant for inclusion in the joint report. Given the roles assigned, it was anticipated that disagreement would occur and opportunities for discussion and negotiation would arise. The following is a summary of the task process as undertaken by the students and key instances during the task are highlighted as **bold** text.

With reference to the implementation of Task 1, the first five minutes appeared rather confusing for the students and they were unsure of how to proceed in conducting the set task, who should take the initiative and, despite a trial period prior to the task,

[30] The quantitative survey forms refer to the instructor as teacher.

were uncertain how to use the synchronous technology software interface. After 05:46 minutes the students began to input text for others to read on the main document window (refer to Chapter 1 Section 1.3 – Synchronous networking technology, for an explanation of the synchronous technology used and an illustration of its interface). However, after 08:26 minutes the students contacted the Administrator (the teacher) as they became uncertain how to proceed. At this point the students were lacking guidance and it later transpired in the interview that they were unfamiliar with such an open-ended approach to task process. They simply wanted to be told what to do. After 12:15 minutes the students again sought confirmation of the task's objective and eventually became frustrated.

Time Hrs:mins: secs: tenths of seconds	What happened
00:01:00:00	After 1 minute the groups established a link with one another and attempted to begin the report outline.
00:01:50:00	Students decided what to type but then one group member relinquishes control of the main document.
	A period of silence while another group types their input to the main document.
00:03:49:00	All 4 groups trying to identify each other.
00:04:41:00	**Students still familiarising themselves with the software interface.**
00:05:00:00	Students unsure how to proceed with the task. Confirming the task objective with one another.
00:05:46:00	Students finding difficulty turn taking online.
00:05:56:00	**Students begin to input ideas** for their task role.
00:06:59:00	Students gain control of the main document and type their ideas. Then invite other groups to 'snatch' (i.e. accept control).
00:07:34:00	While watching other contributions being typed in real time in the main document, the students discuss how synchronous technology such as MSN messenger is used at a school in Singapore.
00:08:26:00	After reading the text from another group, the **students are uncertain how to proceed** so contact the administrator (i.e. the school Principal) via the CHAT window.
00:09:13:00	Students discuss the task objective to confirm their understanding but fail to use the CHAT facility to convey their concerns and questions to other groups.
00:09:59:00	Students again seek help from the Principal. Ask how to start the group report.
00:10:50:00	Principal replies with a similar question about how they, as teachers, would get their pupils started. Students discuss this response.
00:12:15:00	**Students ask another group online for confirmation of task objective.**
00:13:05:00	Students **becoming frustrated** and **tension exists** within the group.
00:13:50:00	Server time up so online contacts lost. Students unsure what is happening.

Table 4-1 Task 1 (data taken from file: Task1All.mov[31])

[31] A sample of digitally captured movie files are available on the accompanying DVD. The summaries in the Tables above capture key moments relevant to the context of the discussion.

Observing the digitally captured movie file and transcript of one group undertaking the task, a number of functions are in evidence: making decisions, identifying, familiarisation, turn taking, formulating answers, associated suggestion, and questioning. These functions, and those in Tasks 2, 3 and 4, were not pre-determined by the researcher, but resulted through interpretation of the language exponents during the course of the Case Study. This is an important statement as this Case Study had no predetermined expectations of what the participants would discuss nor directed the on-task discourse to focus upon specific functions. Essentially, the Case Study sought to observe the processes and products that synchronous networking tasks can facilitate, and attempt to draw conclusions from the triangulation of data collected.

Task 1 functions are exemplified below in Table 4.2 – Observations from the task data. The functions were extrapolated from the transcript and identified as being the key communicative acts in the implementation of Task 1. Despite Task 1 appearing unsuccessful in its implementation and outcome, the participants were fully engaged in the process. The functions reveal that the participants were attempting the task through identifying others involved, making decisions and formulating answers. Participants were offering suggestions and eventually questioning remote users. Although deemed incomplete, Task 1 helped establish a context upon which the participants could relate their experiences and suggest improvements for Task 2.

Function	Evidence
Making decisions	[00:01:16.00] A: do you want to edit anything or not? **anything else?** B: **no** C: **no** ah
Identifying	[00:03:29.00] A: group A group A. he doesnt even know if hes in group A. **whos group D huh? ask whos group D.**
Familiarisation	[00:04:21.00] B: increase communication ah. click down here look A: **you should put it here what**
Turn taking	[00:05:26.00] C: **oh. they left group** A: **never say bye.** we do not agree with your point that IT increases communication. never mind ah. IT increases communication
Formulating answers	[00:06:10.00] A: and wait and the the exchange of ideas is slower C: oh. exchange of ideas in the Internet A: through communication IT to IT

Associated suggestion	[00:07:14.00] C: everybody is formatting their report A: actually ah. you cant do if your are red. if all schools have this huh, it would be easier for teachers to communicate
Questioning (remote users)	[00:11:55.00] A: **tell group A do they want us to continue after their introduction?**

Table 4-2 Task 1. Observations from the task process (data taken from file: Task1All.mov)

As the task was only partially completed, a number of negative issues arose (see Table 4.3 – Negative issues). The participants were unsure what to do and how to proceed without explicit instructions (at 01:12 minutes). They had problems with the synchronous networking software interface (at 01:55 minutes), could not identify other remote groups (at 03:29 minutes), and eventually became quite frustrated (at 06:39 minutes and at 12:55 minutes). At 13:30 minutes the network failed. These points will be taken into account in the development and implementation of Task 2.

Function	Evidence
Unsure what to do	[00:01:12.00] A: start writing ah B: **write what?** A: i dont know. paste ah B: ok
Problems with the networking interface	[00:01:55.00] C: quick snatch A: **you never. wait wait wait**
Identifying other groups online	[00:03:29.00] A: group A group A. he doesnt even know if hes in group A. **who's group D huh?** ask whos group D.
Impatience	00:06:39.00 A: **cmon. snatch people** C: what do you think? A: hey hey. english language
Tension	[00:12:55.00] A: give give B: why you say gives eh? A: i corrected it. you never hear. **you should be able to correct it yourself** what B; oh yeah. im just typing
Technical problem	[00:13:30.00] A: weve slammed the door in your face. corrupted data C; were back A: no

Table 4-3 Task 1. Negative issues (data taken from file: Task1All.mov)

After the task, the students completed the weekly survey form (see Appendix 2, Week 3). It was revealed that the students indicated participation in a number of ACTIVITIES and those similarly reported by the teacher were INFO, EXPLAN, INSTRUCT, GUIDE, QUESTION, GROUPS, EXERCISE, IT, PRESENT. Perceived COGNITIVE OUTCOMES from undertaking the task, and similarly supported by the teacher, were VIEWPOINTS, PROBLEM SOLVING, CORE SKILLS, DECISION, APPLICATION. The categories re-affirmed what occurred in the lesson; the pre-task preparation, the task itself, and the post-task class discussion. Students were provided with information about synchronous networking and open-ended tasks, and a worksheet gave instructions on how to begin the task. Along the way, the students were guided by the teacher and one another. The teacher also attempted to elicit awareness of an open-ended approach to task implementation in order to encourage the students to solve the issues independently but, as stated above, they were uncomfortable of this strategy. Throughout the task the students questioned one another and the teacher, offered their own viewpoints and made decisions but not in a manner that allowed a successful interpretation or completion of the task.

After the lesson, one group of students participated in a discussion to gauge their perceptions of the synchronous networking task and discuss pedagogical improvements for the development of Task 2. The key points taken from the interview have been determined to be negotiation, collaboration, and an exchange of ideas. The interviewees expressed a dislike of certain features, a suggestion to work in smaller groups, being distracted, and were concerned of a lack of an agreed procedure. Evidence of these key points are highlighted in **bold** in Table 4.4 Task 1 Discussion. The task and synchronous networking environment appeared to promote negotiation, collaboration and an exchange of ideas. Although unsuccessful, the participants saw the potential of synchronous networking. The digital capture of the task implementation and groupwork only touched upon negotiation and collaboration as the students quickly became embroiled in disagreement of how to proceed with the task and the technology. This was revealed in the interview as participants explained they did not like the snatch feature (i.e. the collaborative document access button in iStorm) at this stage and were uncomfortable being in control of the main document window in iStorm, became distracted and recognised the need to encourage or enforce an agreed procedure for accessing the main window and undertaking the tasks. As mentioned earlier, students were unfamiliar with such open-ended task procedure and were seeking support on how to proceed. In retrospect, the students needed to plan further before accessing the synchronous network. They attempted this but it appears their plan was incomplete or lacked agreement between members within each group and, eventually, all four groups. These concerns were considered in developing Task 2.

Feedback	Evidence
negotiation	[00:00:23.00] C: but in a way it helps because you know why? [00:00:25.00] C: because you are in groups and when you are in groups you are already negotiating. [00:00:30.00] **you are coming to a consensus within a group before you go and negotiate with another group** [00:00:40.00] C: so in a way it is more efficient instead of having all the class trying to decide what to do
Feature dislike	[00:01:10.00] A: but i don't like the **snatch** part C: **doesn't make sense huh** [00:01:20.00] A: very difficult as some students type slower then they won't get a chance to reply and things like that
Smaller number of groups	[00:01:35.00] A: **i think it is good if its is a small group** B: yeah A: maybe of 4 people or 5 people at the most
Collaboration	[00:01:53.00] A: but they do learn to collaborate also ah using this because they are negotiating. **we do introduction. they give their points**
Keeping control at the expense of others	[00:03:38.00] B: **we hogged the chat**
Distracted	[00:05:32.00] C: too engrossed in the chat B: **too engrossed with the chat rather than the work** [00:05:46.00] A: example, us! [00:05:56.00] A: and the task at hand
Sharing	[00:07:25.00] B: encourages collaborative effort [00:07:37.00] C: **sharing of ideas** A: **it is still peaceful negotiation** [00:07:42.00] B: no but it is different

	C: they can put their ideas on the .. A: everyone [00:07:50.00] B: the way **everyone is given the chance to say something** ah
Lack of agreed procedure	[00:08:06.00] A: **they did not even put up their points** C: **they were logging in and out in and out**
Exchanging ideas	[00:08:26.00] A: they **allow free exchange of ideas** but it is the snatch thing

Table 4-4 Task 1 Discussion (data taken from file: Task1PostActivityWtext.mov)

In summary, a number of issues arose. The CHAT communication was typical in its use of informal language (acronyms, abbreviations, incorrect grammar, inclusion of slang). There was no prior planning in how to conduct the task that would provide cohesion and lead to a coherent output. Strategies for accessing the main document was not negotiated as members within a group would type and then release access to another group before consulting fellow members. As such, turn-taking in synchronous technology was deemed difficult without any prior experience. Trainees experimented but over time (about 5 minutes) became quite frustrated. Trainees were however motivated to keep trying. New ideas were being submitted in the development of the task process even though after 8 minutes some trainees were still not completely clear of their goal. Although group members questioned each other about these uncertainties, it was odd that they did not use the CHAT function to share their frustrations or queries with the other groups thereby utilising the CHAT for 'real' communication (as opposed to the socialising considered an inherent function of CHATting). After 10 minutes though one group did seek help via CHAT from the instructor. This reveals that trainees viewed the instructor as the 'expert' and did not similarly consider successful groups of fellow trainees as being helpful resources. Towards the end of the task (around 13 minutes) one group became frustrated with each other. The researcher noted this in his BLOG and suggested that the trainees were now in unfamiliar territory. They were participating in an open-ended task, flexible in its process, and little instruction given. Trainees were expected to squeeze out the process and a final product through discussion and negotiation with fellow learners. The task was not completed and after 14 minutes of synchronous networking one trainee had become so frustrated she used an expletive to vent her anger.

The trainees are in their final semester as undergraduates and yet they appeared to be out of a 'comfort zone' when confronted with an open ended task using a technology that many use in their social networking online (i.e. CHAT). It is possible that trainees had never been instructed in, or asked to participate in, tasks that did not have specified stages and a model output. Later discussions in the Case Study indeed reveal this but will be elaborated upon later in this chapter. In the post task interview though the trainees remained positive in their thoughts of the synchronous networking task despite the frustrations felt in their first attempt. In summary, from these findings it was concluded that the following needed to be implemented to improve the synchronous networking task:

- Systematic procedure for inputting information to main window
- Maintain focus on task within CHAT window
- Set time limit for access to main window before handing over control
- Create a simpler task that requires less negotiation in the early stages
- Administrator (instructor) to provide more scaffolding and ongoing support
- Ensure an achievable outcome within the time limit
- Set time limit to 15 minutes (20 minutes maximum)

The second synchronous task was thus developed.

4.3 Task 2

The second task involved students developing an outline for an expository essay; four titles were provided for choice. The lesson outline is in Appendix 12. The task took into account the strengths and shortcomings of Task 1 in the following manner.

Concerns from Task 1 as discussed above	How the concern was compensated for in Task 2
Systematic procedure for inputting information to main window	A round robin strategy is used giving each group access to the main document but in a specific order.
Set time limit for access to main window before handing over control	Students are encouraged to discuss and then type ideas in a Text document and then copy and paste into the iStorm main document.
Create a simpler task that requires less negotiation in the early stages	The negotiation takes place within the single groups and then the outcomes are posted into the main document. These points are then discussed by the

	groups online but the focus is merely on what to discard as opposed to what to add.
Administrator (instructor) to provide more scaffolding and ongoing support	The instructor will periodically prompt groups through questioning and timely reminders.
Ensure an achievable outcome within a 15-20 minute time limit	The outcome is intended to be an expository essay outline that has a formulaic structure: introduction, for, against, conclusion.

Table 4-5 Task concerns

Task 2 was then undertaken. The following is a summary of key instances during the task. The students initially had to decide upon an essay title. One group requested working on the *Finding Nemo* topic but another group had already, independently, began detailed work on the expository essay entitled *Do mobile phones cause cancer?* The first group relinquished and the handphone theme was continued. After 07:16 minutes all groups had identified themselves. As per Task 1 there again appeared to be a lack of planning and cooperation between the four groups. It was expected by the researcher that students would have initially identified themselves and discuss how they were going to proceed in this task. However, two groups simply made independent yet opposing suggestions and began inputting their ideas. There appeared to be a focus on reaching an outcome rather than considering the best route towards achieving the goal. This was considered odd by the researcher as the students had input in designing the task. Maybe they assumed that other groups knew what to do and thus they determined that stage 1 (identifying and planning) could be neglected. Between 05:46 minutes and 10:20 minutes the observed group switched to and fro iStorm and the Web, searching for related information that would be relevant to the topic. They made suggestions, clarified points, and then organised the information into Inspiration (software often used in the non-synchronous based lessons and tasks for organising information). However, as they were about to upload their findings to the main document window, another group gained access. This frustrated the group and they had to wait 5 minutes before they could post their findings. After 16 minutes iStorm was paused by the instructor in order to provide time for groups to consolidate their current information.

Time Hrs:mins: secs: tenths of seconds	What happened
00:01:26:00	Students **immediately** connected to iStorm and **without discussing** which scenario to choose (four were provided) one student **chose the Finding Nemo theme**
00:03:52:00	Group typed directly into the main document the morals of the story, Finding Nemo, then released control to other groups
00:04:32:00	**The group was surprised** to read that another group online had decided the handphone theme and were inputting their points into the main window
00:05:46:00	**Group decided to discard their points on Finding Nemo** and continue with the handphones context. Students then left iStorm and searched the Web for related information. They referred to a structured handout to guide their search and focus.
00:07:16:00	Students have **identified the other groups** online
00:07:45:00	Students on task and discussing links between handphone and cancer with reference to the Web pages located via Google search engine
00:10:20:00	Students have **collated information** (via Web) and **organised** it (in Inspiration software). **Suggestions** and **clarifications** made. They try to grab access to iStorm but other groups are quicker and are updating the shared information.
00:11:55:00	A student expresses **dislike over the inability to grab the access** and are thus left waiting for the next opportunity
00:15:48:00	Students **post results** on the main document.
00:16:05:00	**iStorm paused by instructor** so that all groups can consolidate information gathered and also prepare for the combined online group outline for the chosen expository essay title 'Do mobile phones cause cancer?'

Table 4-6 Task 2 (data taken from file: Task2All.mov)

This pausing exemplifies how synchronous networking can be come an integral part of a lesson; in this case, developing an expository essay. By encouraging students to consolidate their information it was anticipated that a more cohesive outcome would result. The task was then continued after a period of 10 minutes offline consolidation. The observed group then typed their main points in the iStorm document window and, after handing over the access to another group, continued to discuss the points verbally. They asked each other questions and sought clarification of some issues that arose within the topic of handphones and cancer. Meanwhile, after 09:48 minutes other groups posted their main points to the document window. The students then eagerly read other postings until a network error disconnected the synchronous document.

Time Hrs:mins: secs: tenths of seconds	What happened
00:00:15:00	Students **immediately connected** to iStorm and **typed** their discussed **points** for other groups to read
00:01:36:00	Students **hand back iStorm main document** and **continue to discuss** the issues discovered on the Web

00:04:20:00	Students returned access to iStorm as no-one else took the opportunity. Cut pasted information obtained and **further discussed through questioning** each other, **seeking clarification.**
00:09:48:00	Students **hand back control** and **other groups**, having also prepared points offline, immediately **paste their main points**.
00:10:18:00	Students read other posts and discuss merits.
00:11:13:00	**Networking suddenly disconnects** and re-connects which interrupts the students and takes them off task
00:12:28:00	Network time up and synchronous network disconnects but document window with submissions remain open. Instructor regains control.

Table 4-7 Task 2 (data taken from file: Task2All.mov)

Observing the digitally captured movie file and transcript of one group undertaking the task, a number of functions are in evidence such as identifying, decision making, suggesting, asking for information, confirming, and sharing. These are highlighted in bold in Table 4.8 – Task 2 Observations from task process. It can be seen that there is much less focus upon the technology. The students were focussed upon the task process and involved in identifying one another early on. They did not do this in Task 1. They made decisions and offered suggestions thereby illustrating they were becoming aware of how to participate in an open-ended task (a task that they provided input in its design). After 5 minutes they asked other groups for information and sought confirmation of what needed to be done. They discussed a procedure for collating information which suggests that students were beginning to develop competencies that supported learning within a synchronous networked environment.

Function	Evidence
Identifying	[00:01:46.00] B: **who is Mac 11?**
Suggesting	[00:03:40.00] B: what are we going to talk about? A: just morals right? [00:03:52.00] B: **or we can talk about courage. both stories have the same theme right?** [00:11:03.00] A: lets go on the net to get questions there
Asking for information	[00:05:30.00] B: **what do other groups think?**
Time keeping	[00:09:00.00] B: 10 minutes up. what you WANT
Confirming	[00:10:08.00] C: now we must form questions to answer B: we are forming. **these are our questions right?**
Strategising	[00:14:15.00]

	B: you want to open up Inspiration ad cut and paste to Inspiration? [00:14:22.00] A: cut and paste into the iStorm
Sharing	[00:15:48.00] A: **send to Hisham** C: this one. copy ah

Table 4-8 Task 2. Observations from the task process (data taken from file: Task2All.mov)

The task was completed, though a number of concerns arose. From the observed digital capture of students on Task 2 it was seen that there was an initial lack of agreement. One group wanted to discuss morals and courage (as exemplified in the *Finding Nemo* movie context) but another group had independently chosen the handphone expository essay context. There was frustration as one group released the document for others to input text but were met with inaction. Were the other groups thinking or had the technology failed? The students who were waiting were unsure. They could have posted a message in the CHAT window to find out but did not do so, possibly because they were focussed on developing the formal text whereas the CHAT window represented an informal activity. Unfortunately, this was not revealed in the post-task interview.

Function	Evidence
Lack of agreement between online groups	[00:03:40.00] B: what are we going to talk about? A: just morals right? [00:03:52.00] B: or **we can talk about courage**. both stories have the same theme right? [00:04:32.00] C: **group D on handphones ah**
Releasing document for others online but nobody responding immediately	[00:05:00.00] C: **we release already but nobody is taking**
When no immediate response, blame is assigned to the technology	[00:07:36.00] C: **is the thing hanging?** A: i think it is lagging right?
Unsuccessful in attempts to gain main window control	[00:11:45.00] A: snatch C: **we do not like snatch. its a lonely world out there** [00:12:06.00] B: only us and Mac 11 trying to snatch

Table 4-9 Task 2. Negative issues (data taken from file: Task2All.mov)

After the task, the students completed the weekly survey form (see Appendix 2, Week 6). It was revealed that the students were undertaking a number of ACTIVITIES and those similarly reported by the instructor were INFO, INSTRUCT, GUIDE, IT. Perceived COGNITIVE OUTCOMES from undertaking the task, and similarly supported by the instructor, were OWN EXPLAN, CORES SKILLS, CONSOLIDATE, NEW IDEAS, DECISIONS. In Task 2 the students were provided with instructions to begin the task (i.e. choose an essay title and develop its outline) and were guided by one another and, occasionally, the instructor who was remotely monitoring the synchronous interaction. The students were seeking information on the Web to support their essay outline. In doing so they needed to explain to others the reasons for using the sourced information and all groups then had to make decisions about its appropriacy. In Task 2 the students began to recognise the value of the synchronous networking task as a worthwhile new idea. They recognised the value of good communication (a CORE SKILL) and felt that they were consolidating previously learned informed ICT utilisation from Task 1.

After the lesson one group of students was interviewed to gauge their perceptions of the synchronous networking task and discussed pedagogical improvements for the development of Task 3. Key points are highlighted in bold in Table 4.10 – Task 2 Interview. The interviewees were very perceptive about the benefits and weaknesses of the synchronous networking technology and task. They indicated that the technology allowed them to consolidate ideas and make decisions as student learners. However, they also recognised their unfamiliarity with open-ended tasks. The task was considered flexible in process and outcome, but the interviewees stated that one group took control and made an independent, un-negotiated decision which, in its effect, took away much of the flexibility. This led to a suggestion that the synchronous technology based task does not necessarily promote negotiation across remotely connected groups but only within groups who are sitting around a computer terminal. The promotion of negotiation at the beginning of a task needs to be built into the task design. Also, the interviewees stated they were unsure what to do and unclear of the task's outcome, despite providing input for the task design. The interviewees suggested that Task 2 was more challenging than Task 1, and compared the synchronous Task 2 with the non-synchronous tasks undertaken in other lessons on this course. However, at this point, they remained concerned about the misuse of CHAT if this technology and associated task was conducted at their school environment. To overcome some of these issues the interviewees suggested a shorter and more purposeful third task.

Feedback	Evidence
Negotiation	[00:03:33.00] A: it was on that MOBILE PHONES CAUSE CANCER activity right? [00:03:40.00] A: we read articles and then we said "should we put this in?" so we discussed [00:03:46.00] A: so we sought of consolidated so **other groups' inputs also came in**
Flexibility	[00:04:15.00] A: **it was very much guided.** we had the steps to follow [00:04:19.00] B: **you tried to give choices. the groups were decided on one but ultimately**
Unclear scope of task outcome	[00:04:40.00] A: **some of us we didn't know what was the scope there. we didn't know what to do**
Decision making	[00:04:51.00] A: then we decide on the topic as a class. there was decision making
Weakness in negotiation	[00:07:46.00] B: but each group kind of like **tried to impose their own text** on the iStorm as opposed to writing a paragraph on [00:08:30.00] R: so the iStorm **people just drop everything in** B: yes
Shorter tasks	[00:09:08.00] B: i'm not too sure but in terms of constructing the whole essay you **need to construct something shorter** [00:09:30.00] B: because there's a lot of things going on at the same time [00:09:35.00] B: maybe just constructing a short paragraph or [00:09:40.00] B: you might be able to reach consensus
A purposeful task	[00:10:12.00] A: that involves society or something but I am communicating with another school with a purpose [00:10:18.00] A: **not for the sake of it.** i'm trying to get info from them and they're trying to get info from me
Sceptical of synchronous communication	[00:11:50.00] B: it seems a bit messy A: yeah [00:11:53.00] B: and people just use it to put in their ideas [00:12:03.00] B: and **there's not any collaboration and negotiation**
Misuse of CHAT	[00:14:54.00] B: the small chat window A: yes

	B: and people were supposed to discuss and put their ideas on the main document [00:15:03.00] B: but **it ended up used for chit chat kind of thing** A: yeah [00:15:13.00] A: but in a classroom scenario **i think students would be diverted from their task** [00:15:23.00] A: it's like i'm talking to you, i'm not physically making a noise in front of the teacher but i'm still talking to you

Table 4-10 Task 2. Interview (data taken from file: Interview1.mov)

The trainees adapted quickly to the technology after their initial frustrations with Task 1 and their first attempt. An initial problem in Task 2 though was that a group would take control of the main document window then begin typing their ideas or their questions in CHAT. This was an unnecessary action as it was predicted (albeit wrongly) by the instructor that the groups would first brainstorm ideas independently (verbally or using Inspiration[32]), display or negotiate ideas in the CHAT window, then summarise in the main document window. In the interview the trainees suggested that synchronous networking promotes negotiation but unfortunately they refrained from practicing this during the initial stages of Task 2. The instructor noted this anomaly and, through trainees' reflections on the BBS and discussions in class, prepared the learners with an awareness of what is considered negotiation and how it can be facilitated. This better equipped the trainees for Task 3 which is discussed later.

From 5 minutes to 10 minutes within Task 2 it was observed that the trainees were absorbed in the task and the technology appeared to become transparent as no reference was made to any technical issues. Trainees were discussing ideas, making suggestions and seeking clarification from one another 16 minutes into the task. They became quite competitive in attempting to grab (or snatch) the main document to input their text though. This was considered negative within the context of cooperation in the development of a group outcome and a round robin approach to access was suggested (and later implemented in Tasks 3 and 4). The trainees were also at ease switching from one application such as a text editor to a Web browser to iStorm (this is termed multi-

[32] Organisational software that promotes digital brainstorming and utilised in the non-synch lessons.

tasking) and were focussed upon collecting, evaluating, collating and inserting key points into the main document window.

The trainees were absorbed in the task after 26 minutes (see Task 2 Text 4 [00:10:18:00] as digital capture was on two movie files) when all groups read other postings. This is in contrast to the frustrations espoused in Task 1 after 10 minutes. Task 2 then was much more focussed thus a clear objective is an important ingredient for a successful task design.

In the post task interviews in week 6 the trainees had become familiar with the survey categories and could relate activities and cognitive outcomes directly to the task undertaken. Planning, questioning, generating new ideas, and making decisions were expressed in the interviews. This data coincided and supports the quantitative data seen in Appendix 2, Week 6 which is discussed in Chapter 5 – Case Study Process and Findings: Quantative Data.

At this stage in the Case Study, participants expressed an awareness of their currently held beliefs in pedagogy that, as many novice teachers may attest, centred around a fear of classroom management. However, more consideration of the learner was also revealed. For example, in her recollection of using ICT during the teaching practicum, one trainee remarked,

> "I saw myself being guilty of denying my pupils the chance of acquiring hands-on knowledge with IT due to my management fears. Often, we were so focused on making the class quiet and orderly that we forgot that pupils needed the opportunity to explore and learn. I guess as teachers, regardless of what subjects we are teaching, we really need to be more risk taking and trust pupils to do what they 'can' do, and not what we Think they can do." LI CHING

In effect, LI CHING is stating that a teacher needs to overcome classroom management fears and afford pupils the opportunity to use technology so that they, the pupils, can demonstrate competency and even usage not envisaged by the teacher.

Confidence in the trainees' awareness of positive ICT utilization did emerge at this half way stage though, as revealed in the following BBS quote, "I guess it's 'forced' upon younger teachers to use IT in our lessons and we use it for the sake of using without considering our roles or the students' roles. Now I understand the mechanics behind an IT lesson and will use it willingly without being forced into it." LAKSHMI

From the above analysis, it was concluded that the following needed to be implemented to improve the synchronous networking task:

- Consolidate ideas required by task early and quickly
- Offer less flexibility in the designed task
- Shorter task
- Purposeful, that is, students aware that other groups have the information required
- Monitor CHAT

Given this, the third synchronous task was developed. Students' input at this stage became more influential in the design of the following tasks. Also, one group of students had designed a synchronous networking task for a hypothetical lesson as part of their coursework thereby informally revealing that students were becoming more confident in the usage and implementation of synchronous networking.

4.4 Task 3

The third task involved students writing a short explanation, with a local context, of the idiom '*biting the hand that feeds it*'. The lesson outline is in Appendix 12. The task took into account the strengths and shortcomings of Task 2 in the following manner.

Concerns from Task 2 as discussed above	How the concern was compensated for in Task 3
Consolidate ideas early on	Groups were provided with a text from a school coursebook which provided a story entitled 'Biting the hand that feeds It'. The story was literal and did not discuss the idiomatic use of the phrase. The groups worked on an associated task (identifying grammar and teaching points) prior to the

	synchronous communication.
Less flexibility	Students were not required to negotiate a topic, only variations on idiomatic exemplification and explanation.
Shorter task	It was anticipated a short paragraph be negotiated.
Purposeful	All groups offline had developed a context and each had a different cultural context. Other groups wished to learn more about the contexts and develop into a negotiated, and agreed, outcome.
Monitor CHAT	The instructor would monitor CHAT again and encourage a focus upon the task.

Table 4-11 Task concerns

The following is a summary of key instances during Task 3 through observing one group of students. The objective of Task 3 was to provide an explanation and a localised example of the idiom, *Biting the hand that feeds it.* The students accessed iStorm after they had prepared for the task offline. They had discussed ideas and decided upon a theme of filial piety to exemplify the English idiom. The groups had imposed a structured round-robin procedure within the task design so each group had to wait their turn. When one group (the researcher's observed group) noticed that their example had been inputted by a previous group they passed on the control of iStorm. While waiting their next turn the students in this observed group discussed the topic further and 2 minutes later (at 08:58 minutes) they read a posting on the main document window. At 11:08 minutes the group regained control and inputted an explanation. Once other groups had submitted their contributions a consensus was reached through discussion in CHAT and students logged out of iStorm. The task was completed at 13:32 minutes.

Time Hrs:mins: secs: tenths of seconds	What happened
00:00:10:00	Students have **prepared for the task offline** and now logged into iStorm
00:00:54:00	Students **await their turn as a round robin strategy has been imposed**. While waiting **they read other submissions** into the main document window.
00:00:10:00	**Their decided idea** of filial piety has been **inputted by a previous group so they pass the document** onto the next group without submitting an example
00:01:50:00	Over the next 6 minutes, while waiting for their next turn, the group is inspired to come up with **6 further examples verbally discussed**
00:07:22:00	Group has access to iStorm and posts one example discussed
00:08:58:00	**Another group modifies an example** and the students read. They then discuss a corresponding explanation, as required by the task.
00:10:38:00	Instructor posts a time warning (5 minutes left)
00:11:08:00	Group regains control of document and **inputs an explanation** for context provided
00:13:22:00	Other groups input and **all agree to the outcome.**

00:13:32:00	Task ends voluntarily.

Table 4-12 Task 3 (data taken from file: Task3All.mov)

Observing the digitally captured movie file and transcript of one group undertaking the task, a number of functions are in evidence (see Table 4.13 – Task 3 Functions) and exemplified in bold text. The functions reveal more focus on the task and not the technology. Initially, task ideas were discussed by the observed group. These included topics such as bank loans, lending money, sharing homework, and a recent insurance scam familiar to all students. The students discussed the details to be developed. This was in contrast to the more superficial content of Tasks 1 and 2. Turn taking went beyond the unconcerned phrases expressed in earlier tasks (e.g. "ah, never mind" in Task 1), to a more considered confirmation of content prior to offering control of the document to the next group in the student-designed round robin procedure. An element of competition was also revealed in Task 3 which suggested students were engaging with the task and wished to eagerly share their example. In short, the task was completed successfully. Looking at the transcript (see functions in Table 4.12 – Task 3 above, and complete transcript in Appendix 6), throughout the task the dialogues focussed wholly upon the task processes. There were no technical issues, and the use of iStorm was not discussed.

Function	Evidence
Task idea	[00:01:00.00] C: stealing the ideas of .. literal sense A: just put literal sense [00:02:05.00] C: i **help you with a bank loan** and then you run away [00:02:23.00] C: yeah you **friend lends you some money** then you don't want don't want [00:02:33.00] C: they lend you a phone then you steal it A: oh yeah [00:03:45.00] B: i let you play basketball then you steal my basketball [00:03:53.00] A: i let **you copy my homework** and when the teacher asks why you have the same you say it was ??? OK [00:09:31.00] C: working relationship B: **hey remember the insurance theme?** C: yeah. she supposed to give you the benefits then she steal the benefits for herself
Confirming	[00:01:50.00] C: figurative. examples?

	B: local examples
Focus on Task details	[00:02:15.00] A: do we have to make that relevant to their experience? [00:02:20.00] C: yeah A: get it smaller scale first [00:07:29.00] C: breaking bonds ah. very interesting B: leaving the country after benefiting from it [00:07:37.00] C: we really think in Primary school mind [00:08:10.00] C: retrenchment. expand on it ah [00:10:06.00] C: a sense of betrayal A: **one word to summarise it** C: **betrayal** [00:10:06.00] C: **will they understand that?** A: **an explanation ah**
Competition	[00:08:58.00] READING NEW iSTORM POST C: who's that? [00:09:02.00] A: we've already summarised the meaning right? B: one example [00:09:06.00] **C: so which example** **A: the first one** [00:09:10.00] ANOTHER iSTORM POST SUBMITTED C: **oh no**

Table 4-13 Task 3. Functions (data taken from file: Task3All.mov)

After the task, the students completed the weekly survey form (see Appendix 2, Week 9). It was revealed that the students were undertaking a number of activities and those similarly reported by the teacher were INFO, EXPLAN, GUIDE, GROUPS, and IT[33]. Perceived language outcomes from undertaking the task, and similarly supported by the teacher, were VIEWPOINTS, APPLICATION, CONNECTIONS, UNDERSTAND, and OWN EXPLAN. The ACTIVITIES recognised by the students and supported by the teacher were similar to those of Task 2. However, Task 3 included the addition of GROUPS. This may be interpreted as students recognising that indeed they need to work in groups cooperatively in order to solve the task posed. In effect this is what makes synchronous networking unique, that is, the development of a shared space that promotes

[33] See Week 9 data in Appendix 2

communication and cooperation as long as it is supported by a constructivist pedagogy. Students also began to recognise that synchronous networking tasks can be applied in their local school context (CONNECTIONS) and were beginning to link their own teaching and learning experiences to those now being experienced in the synchronous networking environment (APPLICATION). They were beginning to apply an understanding of pedagogy to this new environment (UNDERSTAND and VIEWPOINTS). As will be shown in Chapter 6 – Discussion of the Case Study Research, these students' surveys, together with the interviewees and BBS reflections, represent a development of academic competencies.

After the lesson, one group of students was interviewed to gauge their perceptions of the synchronous networking task and discuss pedagogical improvements for development of Task 4. They initially discussed the benefits of synchronous technology (such as facilitating decision making and promoting cooperation among learners). They also made a number of suggestions for task procedure (such as setting a time limit of 2 minutes for access to main document window). The interviewees though soon moved on from discussing the technical aspects of the task. They began to become more aware of their previous didactic pedagogical practices when using ICT, and found that a synchronous networking based task using iStorm, combined with asynchronous technology such as Inspiration, can promote and develop groupwork that can be facilitated in a class of forty school pupils. As inexperienced teachers though, the interviewees were concerned about classroom management issues such as losing control of the pupils as they access the CHAT window. Further exposure to synchronous networking technologies (such as Messenger or iChat AV – see Section 1.3 Synchronous networking technology) and how to incorporate in a school environment was suggested. The interviewees stated that they needed to know how they could resolve classroom management issues before any significant change in pedagogical practices would occur.

Feedback	Evidence
Decision making	[00:00:45.00] M: Hmmm. Definitely DECISION MAKING cause they will **have to decide on topics** and things like that
Cooperation	[00:00:53.00] M: mainly there's a lot of collaboration so in this collaboration there's these things [00:00:58.00] like **decision making, considering your viewpoints**

	[00:01:03.00] will be a major part of collaborative learning [00:01:07.00] so I guess in iStorm that is the tool that really comes out strongly for me
User interface problem	[00:01:30.00] M: My only problem with iStorm is that **I do not like the snatch button** [00:01:45.00] if they have something good to say but they are just not fast enough [00:01:50.00] then there's the problem of people hogging the screen and things like that
Overcoming user interface problem	[00:02:11.00] M: Is there a way where the teacher can control the snatch button? [00:02:14.00] R: No, unfortunately. [00:02:19.00] M: Then perhaps the time, **give them a certain time so that every 2 minutes switch**
Changing beliefs	[00:03:49.00] M: Definitely it exposes me to the fact that I can use IT [00:03:58.00] in a more student centred way [00:04:02.00] because **what I've been exposed to previously is Powerpoint, teacher teach, and that's it!** [00:04:05.00] The only time teachers get to use the computer is when they are going out into the school [00:04:10.00] website to do their assignment or doing research. That's it. [00:04:14.00] which I found **wasn't really productive** for me as a teacher because [00:04:19.00] then **I would have to control 40 different students doing 40 different things** [00:04:23.00] **but now knowing things like iStorm and Inspiration where they can come in groups and work together** [00:04:29.00] **and where it is much easier to facilitate** [00:04:34.00] it does help in my view of how IT can help [00:06:31.00] M: so it is not so much whether teaching u show to use it but [00:06:36.00] more of the management side [00:05:39.00] M: I guess most of us, the only reason we hold back in using IT in a student centred way [00:05:45.00] is **we are afraid of losing control of the class** [00:05:50.00] **the management part.** [00:05:52.00] It's not so much trying to find the content of how to use it in a student centred way but [00:05:59.00] how to facilitate it effectively such that learning can still take place

	[00:06:04.00] and we don't lose control [00:06:08.00] It's not that losing control is bad in that students do get to do things in their own way [00:06:14.00] we don't stifle them but how do we manage that they are on task [00:06:20.00] how do we manage that they know what they are doing

Table 4-14 Task 3. Interview (data taken from file: Interview3.mov)

Task 3 was thus completed much more successfully than the previous tasks. The transcripts and digital video captured revealed that students were indeed on task with only minor interruptions due to a user interface issue (the snatch button). Many ideas were forthcoming in order to answer the set task and it appeared the students were working quite harmoniously, cooperating, discussing, confirming, turn taking so that the task was completed in the set time. Moreover, the CHAT was used as a focus for consolidating and confirming that information posted by each remote group.

In Task 3 the trainees were better organised. They confirmed the task objective to ensure that all groups were clear about the intended outcome and could cooperate in the pursuit of an agreed product. In addition, they prepared their task contributions through discussion and a text editor prior to accessing iStorm (for example, the digital capture indicated that one group submitted after 7 minutes access to iStorm). They read other contributions and sought to develop or modify based upon the information, rather than simply inputting their initial key points. The round robin worked as groups managed the task process by passing the access (snatch or grab button) to the next assigned group. One trainee summarised the task process succinctly,

> "In groups of fours, **we were assigned the task of explaining the idiom** "biting the hand that feeds" using i-storm. Scenario: 3 primary schools (Basir Ris, Hoodlands and Boon Way) involved in this collaboration. **Together, we must explain the idiom and provide an example with a Singaporean flavor. We took turns accessing the main window** to post our formal writing (first Basir Ris, then Hoodlands, then Boon Way). **We arrived at a consensus** fairy quickly as the discussion went smoothly and there weren't many rebuttals." VILAS

Evidence of a change in beliefs in pedagogy began to emerge after Task 2 (discussed above) but became consolidated after Task 3. For example,

> "there are so many teaching points to be extracted from the text "Biting the hand that feeds" like trying to focus on idioms, verb tenses, conjunctions, direct vs indirect speech etc. **Doing that simple activity in class has given me a totally new perspective on how to approach an English lesson for young learners.**" HISHAM

> "One thing that i learnt from the last lesson we had was that many times, **we have the tendency to plan tasks without really looking at the end product**
> **I never knew that planning for a task required so many considerations to be taken.** For example how flexible is it going to be? How do we test whether students have fully understood that particular aspect and how to link it to other aspects.
> The inspiration that we did for the last lesson really allowed me to see a thorough breakdown of lesson planning, **making sure that each step taken by the teacher is a step taken with consideration** and not one that is there just because it must be.
> The istorm exercise that we did was also fantastic because for the first time, we saw how istorm could be carried out from start to finish. **With some sort of organisation in groups taking turns on the main, all groups were able to contribute at a higher level.** I liked it as it was orderly and knowing that we did not have to snatch enabled us to really discuss our plans and ideas with the other members in our group before our turn came to do the posting.
> **It has been confirmed that with the necessary modifications, IT can indeed be a useful tool in education.**" KWOK HUI MIN

The trainees were stating that their experience undertaking synchronous networking tasks challenges them to consider a change in beliefs about teaching (a new perspective) through informed ICT integration that can result in good learning. They became aware of the many considerations in planning a task for learners, the tasks' flexibility in process and acceptable product, the need for learners to organize contributions and access to a synchronous networking document, and reducing task and technology anxiety through negotiated and orderly conduct.

Given the comments and ensuing discussions and analysis, it was concluded that the following needed to be implemented to improve the synchronous networking task:

- Provide enough pre-network time for group to consolidate ideas
- Offer less flexibility in the designed task
- Shorter task
- Purposeful, that is, students aware that other groups have the information required.
- Use of main document window be allocated a limited time and in a pre-determined sequence as this may alleviate the 'snatch button' concerns that continue to be expressed.

The fourth and final synchronous task was developed.

4.5 Task 4

The fourth and final task involved students writing a short story given a series of pictures presented randomly. The students had to remotely discuss and decide a picture order, write an appropriate sentence (or two) and combine to produce a coherent and connected story. The lesson outline is in Appendix 12. The task took into account the strengths and shortcomings of Task 3 in the following manner.

Concerns from task 3 as discussed above	How the concern was compensated for in task 4
Provide enough pre-network time for group to consolidate ideas	The students were only provided with one picture each and did not see the other remote groups' pictures. Students were provided time to write one sentence describing the actions in their individual picture though they knew that this may be altered once all pictures are viewed.
Offer less flexibility in the designed task	The teacher provided the pictures, though they were uploaded to the main document window in a random order. Students can easily manipulate the order by simply dragging the pictures. Other groups can view the alteration in real time.
Purposeful, that is, students aware that other groups	All groups knew that others had pictures that, once

have the information required.	combined, would provide a context for writing a short story.
Shorter task	The idea for this task was taken from an English Primary school book. Students (i.e. the trainee teachers) were given 30 minutes online to collaborate on a story. Moreover, only 3 groups will be collaborating on one document.
Use of main document window be allocated a limited time and in a pre-determined sequence. This may alleviate the 'snatch button' concerns that continue to be expressed.	The sequence of access was set by the teacher. Students could only access the main window via the so-called (student-named) snatch button once they were ready to paste text. All other text had to be in the CHAT frame.

Table 4-15 Task concerns

In this task the students were required to re-arrange images in the synchronous document and develop a short story. There were 3 groups role-playing Primary pupils from 3 schools (Basir Ris, Hoodlands and Boon Way). The following is a summary of key instances during the task. The task was conducted in a much more orderly manner than previous tasks. The participants (students) had recommended a round robin procedure and also the instructor (teacher) to be more involved as a moderator. These can be seen in the events throughout the 34-minute task. For instance, the teacher was requested to place the images onto the main document window for all the groups. After 07:31 minutes the teacher had to intervene to demonstrate how easy it was to move the images around while others can view such movement in real time (i.e. as it happened). The instructor had hoped that this would be discovered by the students through a simple drag and drop action with the mouse thereby indicating some curiosity, experimentation or risk taking. Later the teacher requested students to provide a rationale for their sentences. Here the teacher is guiding the students, ensuring they remain on task, and also acting as a disciplinarian (thereby demonstrating how to overcome some of the classroom management concerns expressed by interviewees previously). Given this, it may be surmised that tasks require an active moderator who regularly posts comments in the CHAT window that indicates his presence to the students.

The students were involved in a number of functions that facilitated the development of the image-contextualised story. They checked understanding, asked for opinions, sought alternative viewpoints, and explained when requested. For example, at 07:00 minutes Hoodlands requested some feedback on its suggested image order via the

CHAT window. However, as the image order developed and associated image sentence development were assigned to different groups, a sense of impatience crept into the task process. At 13:25 minutes students simply wrote a sentence for their preferred image as opposed to that assigned. This may be viewed as a positive trait though. Tasks 1 and 2 were considered flexible in process and outcome but as participants became more involved in the task design (Tasks 3 and 4) it appeared they wished for some leverage of authority by a moderator. Simply put, the participants were still uncomfortable relinquishing control of a task to the learners; even their pre-service colleagues. However, this assumption cannot be applied to all participants. As indicated, some rebelled and chose images independently and even pushed other groups to speed up their contributions (at 18:24 minutes). At 28:58 minutes these students suggested that two such stories could be activated simultaneously. This indeed was a good idea and would make use of the synchronous environment in a task that could not be facilitated by asynchronous technology. In the remaining six minutes the participants completed the task.

Time Hrs:mins: secs: tenths of seconds	What happened
00:00:30:00	The **teacher posted the instructions** and the 5 pictures on the main window.
00:02:38:00	Boon Way and Hoodlands groups have joined the network. Group 'Boon Way' introduce themselves and immediately make a suggestion for the picture order in CHAT
00:03:36:00	'Boon Way' **check understanding** by asking other's opinions
00:05:55:00	Hoodlands **disagrees** with first picture choice and **makes an alternative suggestion.** Boon way quickly responds and **seeks clarification.** Hoodlands **explains its reasoning**
00:06:15:00	Group Basir Ris joins the network. Hoodlands provide a re-numbered alternative for the picture order.
00:06:31:00	The teacher requests that BASIR RIS to begin the story as it had been previously decide they would go first, irrespective of the picture order as this could not be predicted.
00:07:00:00	The main window is still Up For Grabs, awaiting Basir Ris's input. Meanwhile in CHAT, Hoodlands requests some feedback on its suggested picture order.
00:07:31:00	Students are attempting to describe the picture order when the **teacher explained** that the pictures **can be physically moved around via the mouse** and all can view in real time.
00:07:38:00	Basir Ris obtain access to the main document. Boon Way amazed that the pictures can be moved so the teacher instructs Basir Ris group to move the pictures around.
00:08:14:00	Basir Ris type in CHAT that they have written their sentence. Boon Way impatiently request that they post the sentence in the main window.
00:08:25:00	Basir Ris move pictures to their preferred order (though did not discuss in CHAT) but failed to post their first sentence.
00:09:14:00	Boon Way and Hoodlands highlight to Basir Ris that they have failed to post their sentence.

00:13:25:00	The first sentence is posted to the main window but by Boon Way. The students independently decided the picture order and thus wrote a sentence for their preferred first picture as opposed to their assigned picture.
00:14:02:00	Hoodlands question if there is more from Boon Way and that reply as to whether the proper name used is not liked. **Some banter goes on in CHAT.**
00:14:24:00	Hoodlands grabs access to main window.
00:15:35:00	Hoodlands posts the second sentence. It appears that the picture order is now established and groups are writing sentences for the picture of their turn and not that provided by the teacher.
00:18:24:00	Basir Ris obtain access to main window and **Hoodlands pressurises group immediately by asking if they have finished.**
00:18:42:00	Basir Ris post their first sentence. Boon Way immediately 'grab' the main window.
00:25:04:00	Boon Way modify previous sentence and post a second sentence. Meanwhile teacher requests Hoodlands to explain in CHAT what they are doing (i.e. **the teacher is attempting to monitor that the groups remain on task**).
00:28:55:00	Teacher prompts Hoodlands to provide the final sentence. **Students in CHAT write about the problems of waiting and suggest that 2 stories could be activated simultaneously** in order to prevent such 'waiting' by the groups who are not accessing the main window.
00:29:52:00	Hoodlands post the final sentence of the story.
00:31:02:00	Boon Way request a title for the story in CHAT
00:31:36:00	Basir Ris post a title
00:31:40:00	Boon Way, in CHAT, asks if there is a moral to the story depicted via the pictures
00:32:40:00	Teacher asks if Hoodlands prepared to suggest a moral but they reply that they are thinking
00:32:59:00	Hoodlands suggests a moral. Boon Way suggests posting in main window to end the story.
00:33:55:00	Hoodlands asks whose turn it is. Boon Way suggests owner of final picture post the moral from CHAT to the main window.
00:34:27:00	Hoodlands accesses main window and post moral.
00:34:41:00	**Teacher commends all groups for a job well done** and indicates that the task is now finished. Network is closed.

Table 4-16 Task 4 (data taken from file: Task4All.mov)

Observing the digitally captured movie file of the task, the functions of suggesting, helping, requesting and being independent are in evidence. Note that this task and its development were captured but, due to an unforeseen networking problem, without the audio. The clarity of the task objective and the assigned roles of the three remote groups supported a learning situation that allowed students to offer suggestions, clarify information and request feedback and help. These are highlighted in bold in Table 4.17 Task 4. At this stage the students were more independent in task accomplishment and procedure, although built in to the design of the task was the need for a teacher to act as a moderator in the synchronous networked environment. The role of the instructor/ teacher as moderator is supported in the literature by Salmon (2002). There was also an element of competition (as exemplified by one group pressurising and prompting another to post their sentences) which may illustrate that students were no longer focussed upon, nor frustrated by, the technology and its interface. The students remained committed to the task resulting in a number of additional cognitive outcomes that were recognised by the participants and the researcher.

Function	Evidence
Suggesting	00:05:55:00 Hoodlands disagrees with first picture choice and **makes an alternative suggestion.**
Clarifying	00:05:55:00 Boon way quickly responds and seeks clarification. Hoodlands **explains its reasoning**
Requesting	00:07:00:00 The main window is still Up For Grabs, awaiting Basir Ris's input. Meanwhile in CHAT, Hoodlands **requests some feedback** on its suggested picture order.
Helping	00:09:14:00 Boon Way and Hoodlands highlight to Basir Ris that they have failed to post their sentence.
Being independent	00:13:25:00 The first sentence is posted to the main window but by Boon Way. The students independently decided the picture order and **thus wrote a sentence for their preferred first picture as opposed to their assigned picture.**
Prompting	00:18:24:00 Basir Ris obtain access to main window and Hoodlands **pressurises group immediately** by asking if they have finished.

Table 4-17 Task 4. Functions (data taken from file: Task4All.mov)

After the task, the students completed the weekly survey form (see Appendix 2, Week 10). It was revealed that the students were undertaking a number of activities and those similarly reported by the teacher were EXPLAN, INSTRUCT, GROUPS, and GUIDE[34]. Perceived learning outcomes from undertaking the task, and similarly supported by the teacher, were UNDERSTAND, VIEWPOINTS, CRITICAL, and CONNECTIONS. As per Task 3 the participants in Task 4 had opportunities to offer explanations and guide fellow students. In addition there was guidance from the teacher (as moderator) and, again, participants recognised the need for group work, as exemplified in the cooperation discussed by students above. Participants were also again considering how the task and synchronous technology can help foster a social constructivist pedagogy at their schools

[34] See Week 10 data in Appendix 2

(CONNECTIONS). The participants recognised they were also making connections to the literature on ICT in education and informed ICT integration that was being presented in the course. They were also being more openly disparaging of their previous learning experiences with ICT. This is due to the participants gaining in confidence which may have been facilitated by the eleven (11) weeks of weekly reflections and discussions throughout this Case Study. The completion of the surveys, the BBS contributions, the discussion of a wide range of educational technology related topics throughout the 12 week course and Case Study, plus their input in the design and implementation of synchronous tasks, resulted in increased academic competencies. For instance, looking at the weekly survey graphs in Appendix 2 it can be seen that participants made increasing connections between their school environment and synchronous tasks (this is considered epistemic competency and is discussed in Chapter 6 – Findings of the Case Study Research). Also, participants recognised they were being more critical, learning alternative views on ICT integration, and suggested they understood the concepts of informed ICT use and task application (these are flagged as CRITICAL, VIEWPONTS, and UNDERSTAND in the surveys and considered declarative competencies). The development of these competencies is revealed in detail through the BBS contributions and is discussed in detail in Chapter 6 – Findings of the Case Study Research.

Immediately after the lesson, one group of students was interviewed to gauge their perceptions of the synchronous networking tasks. It may be seen that the participants were becoming aware of their previously held pedagogical beliefs and due to their experiences in this Case Study were in the process of challenging these beliefs. For instance, in the final Task 4 follow up interview the participants discussed a number of issues that had been apparent throughout all the tasks (turn taking, technology problems, relevance to school environment) but were now discussing why these issues arose and what solutions could be provided. This increased awareness allowed the participants to gain in confidence to communicate and exchange ideas freely in the synchronous network environment. These pre-service teachers recognised the need to develop independent learners (i.e. their pupils at school) as desired by Singapore's Masterplan for IT in Education (discussed in Chapter 2- Literature Review) but wanted to do so cautiously. The teacher, they stated, needed to remain a manager as well as a facilitator and only offer partial control, in stages, to the pupils. This may be due to their inexperience but also they felt constrained by the expectations of their teaching colleagues (their mentors), the pupils, and the parents. This was confirmed in a follow-up interview with another group one week later.

Feedback	Evidence
Allows learners to exchange ideas	[00:00:22.00] B: I think it helps students to learn collaboratively; it encourages them to **interact socially**; **conversing** online and helps them **exchange ideas** with other students over distance
Turn taking	[00:00:56.00] A: Usually when students are sitting around the computer, **not everyone takes turns**; usually there is **one dominant person** but as we moved on to the next iStorm we **gradually begin to take turns**, particularly **when the teacher says to take turns.**
Task management by teacher	[00:01:21.00] A: **The teacher must say to take turns to us the computer** [00:01:26.00] R: so the teacher is still important in managing and prompting A: and facilitating
Partial independence by learners	[00:01:46.00] A: **the teacher must give some instructions** R: Ok [00:01:55.00] B: assuming that the students are able to manage themselves. let others have a chance. [00:02:03.00] Otherwise one group will dominate and refuse to give the button to let others respond
About the unreliable network	[00:03:02.00] B: and what if it's just 2 schools and one school has failure performance and the other 2 will just be left stranded
Benefits of synchronous task	[00:04:20.00] B: I think they produce new ideas A: Also critical thinking R: OK [00:04:25.00] B they **can develop other people's responses. viewpoints**. also **construct their own explanation**. Hmm
Changing beliefs	[00:05:16.00] A **Initially I thought iStorm was waste of time.** Initially there were technical problems and I questioned the benefits of it but after a number of tries I think it can be useful to ask questions, opportunities for questions I am now comfortable with it and realise **we can learn with other students in other schools** [00:05:32.00] A: **I really thought iStorm changed my beliefs**. After some practice I think we can try and I think students will feel motivated, get motivated to use iStorm

Table 4-18 Task 4. Interview 1 (data taken from file: Interview4.mov)

An additional interview was held one week later in order to establish any further points that participants may have wished to raise. Having completed the surveys and posted reflections on the BBS, the participants expressed a number of interesting viewpoints that re-affirmed their awareness of the need for informed ICT use that promotes good learning within their classroom. As previously mentioned, such awareness is due to the reflections which may have been inspired by participating in the surveys on a weekly basis, whether undertaking synchronous tasks or not. Being directly involved in the iterative process of this research may have also developed students' self awareness. One participant mentioned how he became more aware of applying, consolidating and explaining information his group had generated during a task. The clarity of the procedure in Task 4 was also welcomed by participants and the task difficulty level was considered appropriate. He reported that some knowledge of the topic in a localised context made the task more interesting and, like many reports on ICT usage, increased their motivation to partake in the task process to seek a cooperative outcome.

At this juncture the participants were quite explicit about their change in pedagogical beliefs. The interview categorised these changes in four contexts: technical support; desires of pupils, colleagues and parents; the Singapore context; and alternatives to current practices. In each context though the participants remained sceptical of implementing a constructivist pedagogy utilising synchronous technology. They stated that they anticipated little, if any, technical support and would have to rely upon like-minded colleagues or their own IT skills. Cuban (2002) refers to such misplaced authority in academia as the tyranny of technical support.

The concerns of wishing to meet the expectations of the stakeholders such as the pupils or the parents, and also the in-service teaching colleagues supports the concerns of Pavri (1998) who states that teachers who question established practices in Singapore are often looked upon with disdain (see Section 2.8 – The concerns about incorporating ICT in education).

Participants commented that not only pre-service teachers need to be exposed to constructivist pedagogy in practice (such as the synchronous networking tasks in this research) but so should their in-service colleagues. There needs to be a change from teachers as information providers that is often serviced through a didactic approach, to facilitators of knowledge transformation. The parents though also pressurise teachers to teach to the test as Singapore's schooling relies heavily upon high-stakes testing of its pupils. Although the Singapore government, and these research participants support a more student-centred classroom environment, a measure of a pupil's worth remains linked to a standardised test score. As stated by the ACOT researchers, for ICT to have any impact on education then an alternative mode of assessment needs to be considered (Sandholtz *et al.*, 1997).

The participants also sought guidance and support from the Ministry of Education (MOE) if they were to be risk takers. The pre-service teachers were caught in a dilemma of having to conform to established practices yet attempt to be change agents in education. They felt a fear of being 'penalised' using 'unauthorised' technology. Still, many participants recommended all trainee teachers partake in the course 'Computer Applications in Language and Literature' upon which this Case Study research was developed. As the students became exposed to both synchronous and asynchronous technologies and related tasks there became an appreciation of using ICT in an informed way that supported a constructivist pedagogy. As participant B commented at the end of the interview, "Then we'd have good teachers."

Feedback	Evidence
Negotiation	[00:01:30.00] where you had 4 of us and we had to come out with 1 sentence so we had to kind of negotiate
Decision making	[00:01:39.00] so we had to decide on something so I guess that is decision making
Exchange ideas	[00:01:53.00] B: and show alternative viewpoints A: viewpoints hmm B: had to come out with something that everyone had to respond
Reflection	[00:02:13.00] A: actually there is a bit of everything lah B: hmm [00:02:19.00] A: because they are inter related B: and of this overlaps [00:02:23.00] B: but it is good we get to see this because **we kind of realise what we are doing** [00:02:27.00] B: because in half an hour or in one hour we don't know we are doing all this as we go through these **we kind of realise that i can apply myself, consolidated, explain.** that is quite good
Focussed upon the task	[00:03:28.00] A: they have to come out with the story line because **they know who's turn is it** so

	they know what they are supposed to do, the planning, before it is their turn to put in whatever information when it is their turn
Use of CHAT pane	[00:03:43.00] And of course if there are any other enquiries they want to discuss with the other group they can use the conversation box, right?
Planning but downtime issue	[00:04:02.00] B: i agree with what she was saying. they can prepare what to write but i feel that the **wait time is a bit too long sometimes** you just drift away from the activity [00:04:20.00] eventually we decided to write something then **there's nothing much to do.** [00:04:25.00] unless you - TEACHER- is checking by the side
Task difficulty	[00:04:57.00] A: maybe it depends on the activity itself. **if it's too simple of course they will take a very quick time to just put in , not think of it** [00:05:05.00] **the idiom was quite hard so you were thinking like maybe it could be this, could be this** [00:05:10.00] so it depends upon the lesson itself. what kind of activity is being put up [00:05:57.00] but for this - iSTORM STORY BUILDING - because there were five of us , five or four of us coming out with only one sentence then basically if one guy does it then three or four don't have to do anything R: right. good. points taken
Use of prior knowledge and authentic context	[00:05:32.00] B: i guess the level of difficulty but also i guess prior knowledge when we did the idiom you wanted us to do it in a local context so it was interesting. [00:05:50.00] **we had some prior knowledge** of parents and scholars **so we had a lot to say**
Changing beliefs but sceptical of Singapore teaching environment - technical support	00:06:47.00] A: in a way, yes. i notice that, remember the first few times that we tried this software and there's a lot of glitches after a while **we got the hang of it but that is because we had IT assistance by the technician** [00:07:03.00] but let's say we had this kind of assistance at school this kind of lesson will be very interactive for students [00:07:18.00] it's an idea but currently, i mean **from my school** that i'm being attached to for my practicum definitely **there is no IT assistance** so for that particular school i wouldn't think of this [00:07:28.00] R: so that is a key point then , support A: yes, it's the support [00:07:36.00] A: that's the most important thing especially when we do not know how to operate it [00:08:00.00] B: **I agree with what she says. I think we can't get the support**
Changing beliefs but sceptical due to Singapore teaching context- desires of students, parents and school	[00:08:08.00] when I chose this module i was hoping to be a different kind of teacher one who is proactive, you know who thinks IT is the way to doing things but having gone through all this I realise that some of this may not work [00:08:27.00] it's like beyond , i may be wrong, but **certain things we are doing is beyond what students will want to do or what the parents will want** , you know [00:08:46.00]

	Singapore schools is like, I mean I'm talking about my practicum school, they want worksheets. **they want to give students worksheets** they want **to see evidence of work. of understanding of scoring A's**, more than 80's , 90's so if i was going to do this, obviously it will be interesting but i do know whether i can generate the kind of results like worksheets kind of thing
Changing beliefs – pessimistic of Singapore context	[00:09:08.00] B: **i'm a bit pessimistic** but i'm hoping to be the new kind of teacher you know to be able to do all this [00:09:18.00] A: **maybe before we have to change our mindset, the children's mindset we have to change the school's mindset first**
Changing beliefs - alternatives to current, established practice not presented by MOE, Singapore	[00:09:41.00] B: **the educationalists still haven't given us any ideas on other alternatives** [00:09:53.00] A: they must standardize we can use right so if they have given us alternatives we can pick and **they won't like penalise us for this is unauthorised**, this is not supposed to be, and what s the one we are supposed to do?
Changing beliefs - recommendation	[00:10:16.00] B: but one thing I know for sure, i think uh **this 442 course should be made compulsory for all teachers** because there is some good in taking this course you kinda appreciate IT and you know there are more things to do than just Powerpoint B: so have things like iStorm, Inpsiration , brainstorming [00:10:38.00] we think of brainstorming with pen and paper but we can do it here we can actually share so it's kind of interesting [00:10:47.00] Like i was saying, **i was pessimistic kind of person but there are some good in taking this course i think you should make the point that all students take this. all trainee teachers take this** [00:10:59.00] R: sounds great. we 'd love it to be compulsory . yeah we'd love to B: **then we'd have good teachers**

Table 4-19 Task 4. Interview 2 (data taken from file: Interview5.mov)

In summary, Table 4.19 -Task 4 Interview 2, reveals evidence of negotiation, decision making and trainees expressing alternative viewpoints throughout synchronous networking task. A number of technical difficulties were mentioned (network downtime, misuse of CHAT) and task issues (task difficulty) arose but these did not inhibit or interfere greatly with the learning process and product outcome or objective. Trainees commented positively on the use of a familiar, authentic context for the synchronous task but remained cautious in their optimism for undertaking such tasks in a Singapore school either due to lack of technical support or a lack of confidence in the school's IT infrastructure. Yet no trainee in the interview mentioned the issue of large classes of 40 pupils. However, this was brought up by one trainee in the post task BBS postings. As well as the teachers' mindset or beliefs changing, the trainees also commented that students too will need to change their mindsets about taking ownership of learning[35]. The trainees were also wary of the power or impact of individualised change and look to the Ministry of Education for guidance in 'acceptable' practices. The trainees admitted though that Government policies are rich in content but poor in ideas for implementation. In short, the Singaporean trainees are not used to the independent change that this Case Study research has brought about, as evidenced in the following section. Finally, the students were positive in their recommendation that all trainees should participate in this course that utilises synchronous networking technology to facilitate a change in beliefs in teaching 'informed' ICT.

4.6 Re-visiting the task feedback

After collating all the data for the Case Study, the Task feedback was re-visited in order to study how the participants' understanding of synchronous networking tasks developed. It was determined that the feedback could be sorted into four (4) distinct categories: the communication, the task construct, the learning, and the technology. These are discussed below.

4.6.1 The communication

The functions that have been determined to form the communication category are illustrated in Figure 4.1 – The communication. As mentioned in Section 4.2 - Task 1, these functions were the result of the language exponents used by the participants in their discussions of each Task process and outcome. The exponents illustrated in Figure 4.1 – The communication, show that synchronous networking technology from the first task facilitated students negotiating. The students expressed benefits of communication within their sub-groups and then communicating synchronously with other groups on the network. Synchronous networking thus allowed students to consider alternative viewpoints and exchange ideas, which was perceived as supportive of collaborative learning. The focus upon good communication was apparent throughout all post-task

[35] See Towndrow & Vallance (2004) Chapter 9- Teachers, Students and Computers, for a discussion on changing roles of students within a Singapore context.

interviews. As HUI MIN stated after Task 4, "With some sort of organisation in groups taking turns on the main, all groups were able to contribute at a higher level" (see Section 4.4 Task 3). There was thus an additional perception that the good communication in turn led students to be challenged and produce better work. However, although the exponents in Figure 4.1 – The communication, may explain why the communication was good (i.e. negotiation, exchange of ideas, decision making), they do not necessarily show how such communication was inspired. Looking back at the characteristics for integrating technology (see Section 2.7 – Characteristics of informed ICT integration) the general statements also do not directly specify how to facilitate good communication. However, after re-visiting the participants' feedback, observing the digital capture of the participants' processes in undertaking all four tasks, and referring to the developed categorisations of key factors for informed ICT integration (see Table 2.3 - Key factors for informed ICT integration), it may be surmised that a task requires meaningful communication and a task's meaningfulness is determined by its relevance to the students (i.e. the task needs to have an authentic purpose and context), the integration of content (i.e. integration of subject syllabus or across disciplines), and a shared space (i.e. opportunities to work in groups on and off the computer network). The functions in Figure 4.1 – The communication, may thus be considered to support the success of promoting good communication.

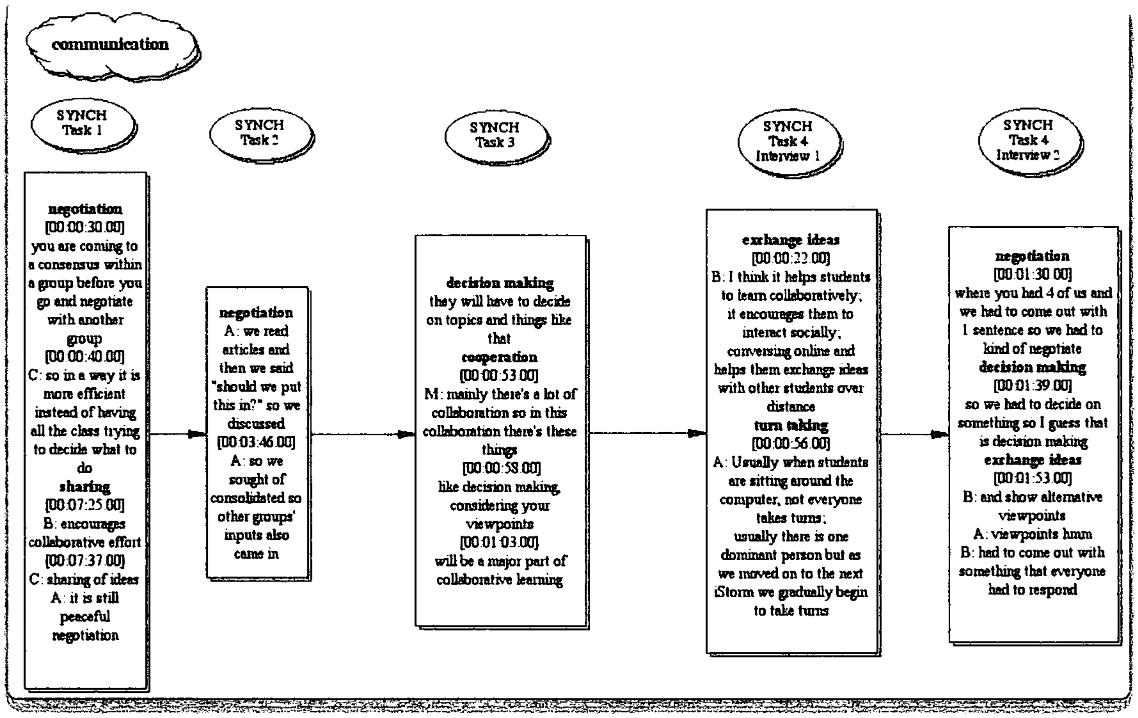


Figure 4-1 The communication

4.6.2 The task construct

After Task 1, a number of suggestions were made by the participants in order to improve the design of the second task. They suggested smaller groups and a reduction of flexibility in terms of process (how to undertake the task) and outcome (what to produce). The initial flexibility afforded by Task 1 led to students keeping control of the main document frame and not being too concerned about sharing it with others on the network. The participants' feedback led to the design of the second task but this too had inadequacies identified by the participants. They felt the task needed to be shorter, more purposeful and have a clearly defined target outcome. Such comments may reflect the insecurity these pre-service teachers had about unpredictable processes and outcomes so much part of a constructivist approach to learning. As mentioned in 4.6.3 – The learning, below, the participants become concerned about classroom management issues or criticism from their school supervisors. For instance, even after the fourth task a participant remarked that the teacher should directly control students in their turn taking. This may be interpreted as the participant unwilling to pass ownership and responsibility over to the pupils immediately. One participant in Task 4 Interview 1 stated that this was facilitating, so it appears that there is a misunderstanding over the support a pupil requires during the task process. In effect, the design of a task will not be effective if a teacher is disallowing pupils' independent construction of knowledge. Further points raised in Task 4 Interview 2 included the need for an authentic task that was focussed and offered pupils a challenge with an achievable outcome. It was stated that this requires planning. Therefore, the discourse from Task 1 through to Task 4 can be seen to have progressed from an appreciation of a lack of an agreed procedure to suggestions for improved task design (i.e. flexible, shorter, purposeful) to a need for planning for each of the aforementioned points. Participants were thus becoming skilled at implementing pragmatic tasks and this was complemented by the BEd course input that helped students consider informed task design. In summary, the task design may therefore need to consider the process, outcome, difficulty and content.

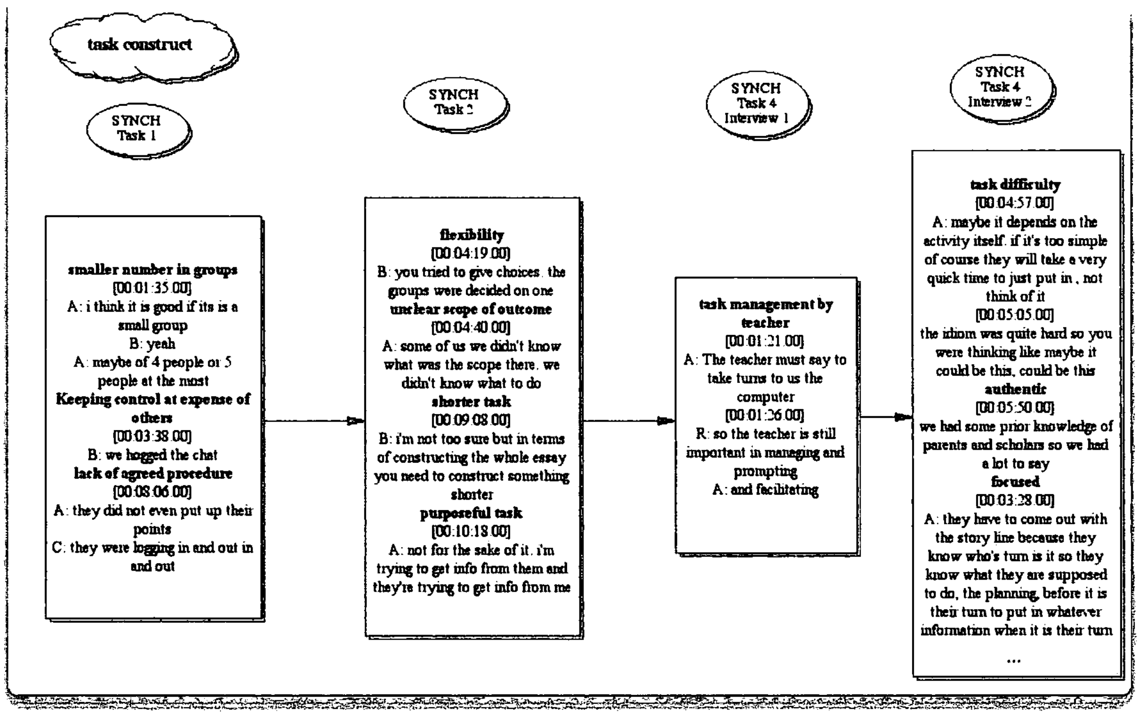


Figure 4-2 The Task construct

4.6.3 The learning

The learning of the participants is best represented by their discussions about how their pedagogical beliefs had developed during the period of the Case Study. For instance, the usage of one technology (i.e. PowerPoint) implied a representation of traditional, didactic teaching. The recognition that the synchronous technology allowed students to work in groups may be considered to reveal students' thinking of technology use in a more pupil-centred (possibly constructivist) environment. This is not made explicit by the participants though. Further study of the exponents show that in Task 3 (see Figure 4.3 – The learning, below) the participants draw a distinction between a teacher-centred classroom where control over 40 pupils is of paramount importance and a student-centred classroom where concerns over a loss of control is worrying. Such classroom management concerns though may not necessarily be related to synchronous networked tasks or any use of ICT in general, but a concern that many novice teachers have in their early years of teaching (Russel *et al*., 2003). However, it was encouraging that the participants were beginning to consider the possibility of a less didactic teaching approach to one that facilitates group work and a focus upon student-centred learning. Such considerations had an immediate impact upon the design of the fourth synchronous network task but whether any long term impact may be registered will have to be determined through further research (for instance, in a school setting).

In addition, as the participants neared the end of the Case Study research and BEd course the final interviewees remained sceptical about implementing a student-centred task facilitated by synchronous technology in their school. However, such scepticism is not surprising as Russel *et al*. (2003) found that teachers with less than 6-years experience tend to believe that technology can have a negative impact upon student learning. These teachers also use technology more for their preparation but require students to use technology significantly less than those teachers who have taught for 6 to 15 years. The comments in this Case Study reveal too that trainee teachers are wary of passing control of the technology over to the pupils for fear of loss of control (classroom management issue) and retribution from the school and parents.

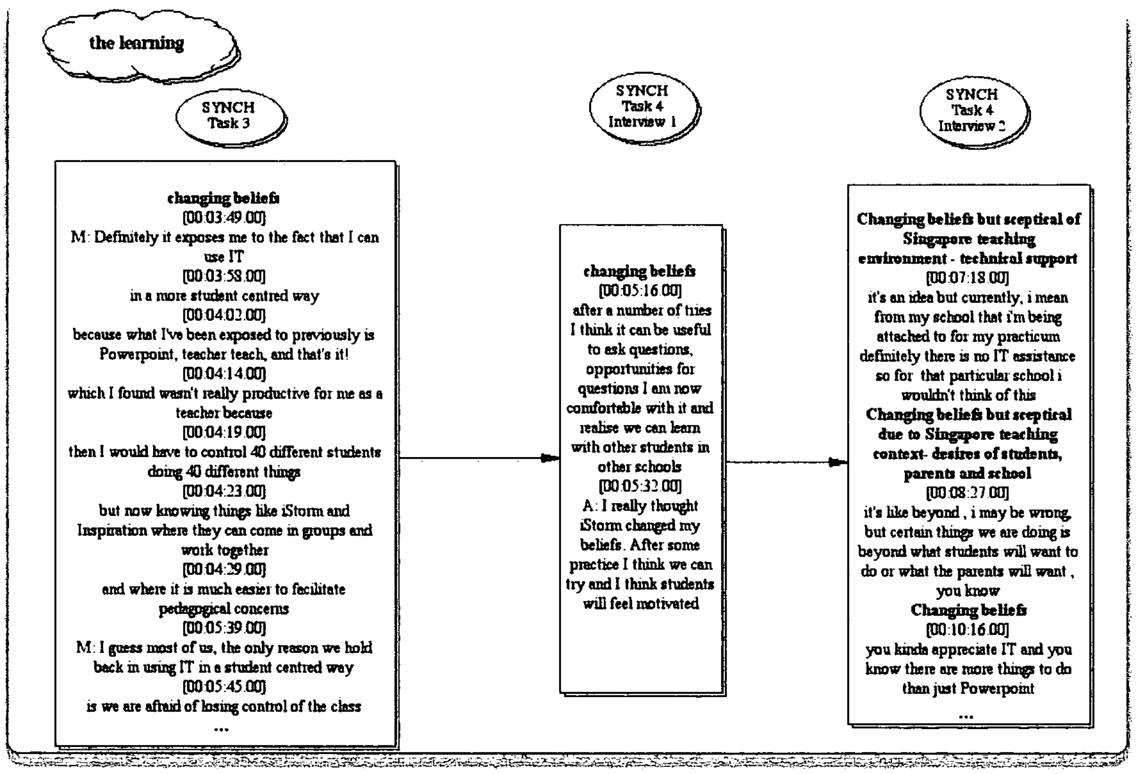


Figure 4-3 The learning

4.6.4 The technology

The technology played an important part in the discussions as initially it was so central to the participants' actions. However, by Task 3 the emphasis was less on the technology and more on the pedagogy and the task process. A number of the comments criticised the software interface or a certain feature such as the grab (or snatch) button. Initially the students felt that the synchronous software, due to its use of the familiar CHAT option, simply allowed users to discuss informally, often off- topic. However, as students used the software more, this concern did not arise. Looking at the digital capture of Tasks 2 to 4 there was little off-topic discussion in the CHAT frame as students became focussed upon the clear objectives negotiated as part of the iterative task design process. The later comments about the technology offered advice on how best change or utilise synchronous networking (see Figure 4.4 – The technology, below). For instance, in Task 3 one participant suggested a time limit for inputting text into the shared document frame. This suggestion was implemented in Task 4. Therefore, it may be concluded from the comments illustrated, plus those within the digital capture task processes, that students require time to become familiarised with the technology. They require time to explore and to adapt to an unfamiliar interface that may have features never before experienced. It is also important that software developers consider such feedback in their design of educational technologies. For instance, the iStorm developers were responsive to the comments forwarded. Although they could not implement changes immediately, they did update iStorm during our Case Study to make the grab button less obtrusive.

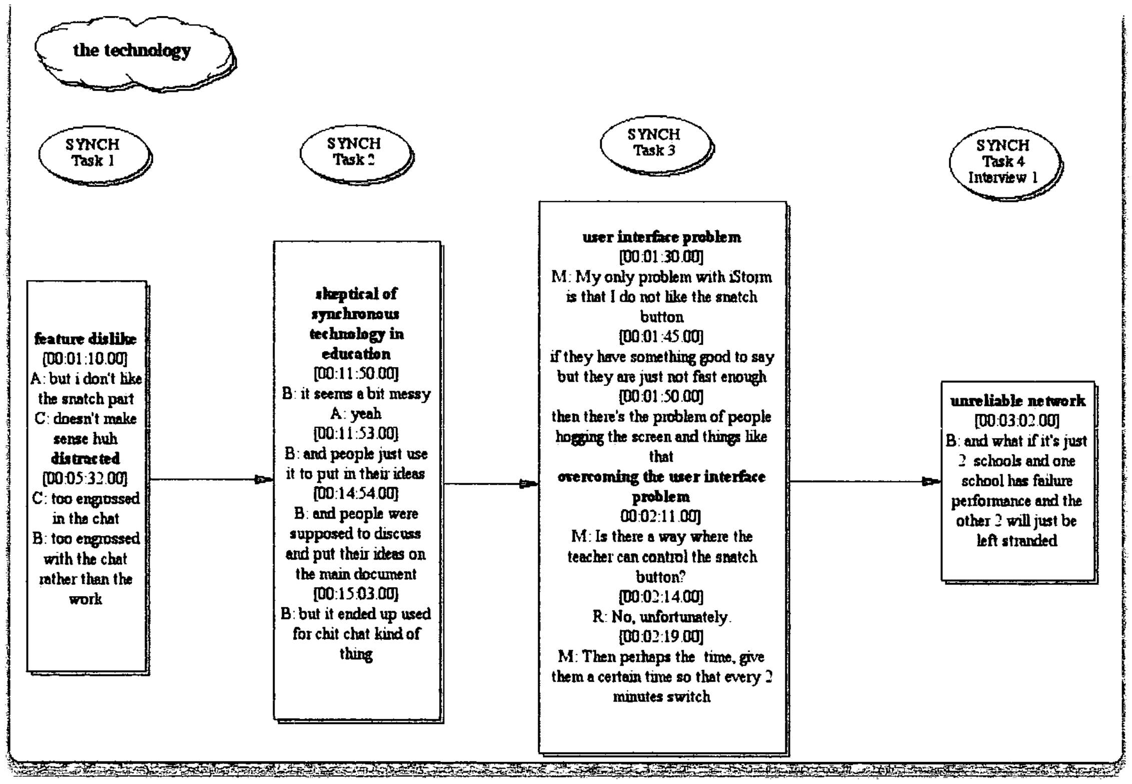


Figure 4-4 The technology

4.6.5 The basis for a proposed framework for informed ICT

Given the discussion above, it is therefore proposed that a framework for ICT utilisation may be developed as a result of the four distinct categories above. The main emphasis of the participants' discourse may be determined to state that the communication needs to be meaningful, the task design should be negotiated, the technology should be afforded time for familiarisation, and the learning needs to be good. A framework however cannot be fully developed until a corresponding analysis of the quantitative and qualitative data is undertaken. The outcome from this chapter has demonstrated the Case Study process has at least provided a foundation upon which to consider the possibility of a framework for informed synchronous networking technology use in education.

4.7 Summary

This chapter has detailed the iterative development of the synchronous networking tasks throughout the 12-week course (Computer Applications in Language and Literature) that provided the platform upon which this Case Study research was superimposed. The chapter has shown how the participants became deeply involved in undertaking the synchronous technology based tasks and then commented upon the strengths and weaknesses of the tasks, the associated activities, and the perceived cognitive outcomes. The researcher identified a number of functions such as decision making, turn taking, and suggesting throughout the interviews, and used these to develop recommendations for improved task design using the synchronous technology software, iStorm. Given the quantitative data from the surveys and the qualitative data digital capture, interviews and BBS postings, as the tasks were being developed the researcher recognised an increased level of competency. Further reading of the related literature resulted in classifying these competencies into three categories: generic, epistemic and declarative. These will be discussed in Chapter 6 – Discussion of the Case Study Research. The triangulation of data (i.e. the digitally captured task process, the survey reports, and the follow-up interviews and BBS postings) also allowed the researcher to develop a proposed framework for informed use of ICT. This too is discussed in Chapter 6 – Discussion of the Case Study Research. But before doing so it is timely to view the details of the quantitative data, Chapter 5 – Case Study Process and Findings – Quantitative Data.

Chapter 5 CASE STUDY PROCESS AND FINDINGS: QUANTITATIVE DATA

This chapter highlights the key findings from the quantitative data collected during the Case Study research. This represents another node of the triangulation of data collected that was cross-referenced for the analysis that considers the impact on synchronous networking technology on the pre-service teachers in this Case Study. The data was collected as weekly student surveys focussing upon activities and cognitive outcomes, synchronous task actions, and post synchronous task interviews. For ease of reading the ACTIVITIES and COGNITIVE OUTCOMES will be in upper case, as will indication of a synchronous task (SYNCH) and non-synchronous task (NON SYNCH).

5.1 Introduction

Recall that this Case study research was conducted during a regular under-graduate, final year, pre-service teacher training course (Computer Applications in Language and Literature) and that four (4) instances of synchronous networking were held in conjunction with seven (7) instances of non synchronous IT based lessons. It was important to collect data for all the lessons in order to gauge the activities and learning outcomes from both approaches to IT rich tasks. Students posted their reflections of the lesson on the class BBS immediately after the class or as soon as possible thereafter (and certainly prior to the next lesson), and interviews were conducted immediately after the SYNCH tasks. The qualitative data is discussed in Chapter 4 - Case Study Process and Findings: Qualitative Data.

Survey response rate was good (80% of synchronous task surveys and 60% of non-synchronous task surveys were completed over the Case Study duration). Moreover, the instructor's online diary/BLOG and surveys also helped highlight any large errors in perceptions of that being taught and that learned. Also, the data was used in the formulation of the iterative task designs by observing the ACTIVITIES and COGNITIVE OUTCOMES, finding meaning in those selected by simultaneously referring to the qualitative data, and then attempting to design a SYNCH task that would overcome some of the weaknesses represented in this triangulation of data. Finally, as all students completed the ACTIVITIES and COGNITIVE OUTCOMES surveys, the collated quantitative data could be used to compare the breadth of learning for lessons rich in synchronous tasks and, then, non-synchronous tasks. In this chapter, an interpretation of the total collated data over the 12-week course is discussed.

5.2 Synchronous and Non-synchronous tasks

After inputting all the weekly survey data into an Excel spreadsheet, the values were accumulated as a percentage. Note that there were four (4) distinct instances of a network synchronous activity (i.e. in four lessons) and seven (7) non synchronous lessons. The compared data was then graphically represented; see Figures 5.1 - Comparison of CLASSROOM ACTIVITIES for synchronous and non-synchronous lessons. and 5.2 - Comparison of COGNITIVE OUTCOMES for synchronous and non-synchronous lessons.

5.2.1 Classroom Activities

It appears that many activities scored similar percentages in SYNCH and NON SYNCH lessons. Five (5) categories scored higher for the SYNCH based lessons: the IT category (100%:97%), which was expected; the NOTES (50%:45%) and WORKNOTES (54%:24%) which may have been interpreted as extra handouts that were provided in SYNCH lessons whereas NON SYNCH lessons were contextualised by the coursebook; INSTRUCT (98%:92%) which may be due to specific instructions being made more explicit in SYNCH lessons whereas in NON SYNCH many tasks relied upon the information provided in the coursebook; however, EXERCISE (92%:89%) is interesting as SYNCH activities may have been perceived as solely completing an exercise whereas NON SYNCH may have been a mix of exercises and teacher directed input. It is not surprising that more NON SYNCH activities scored higher than SYNCH activities as much of the NON SYNCH course work allowed students specifically to get involved in a variety of tasks that encompass different modes of presentation, process and outcome over the 12-week period.

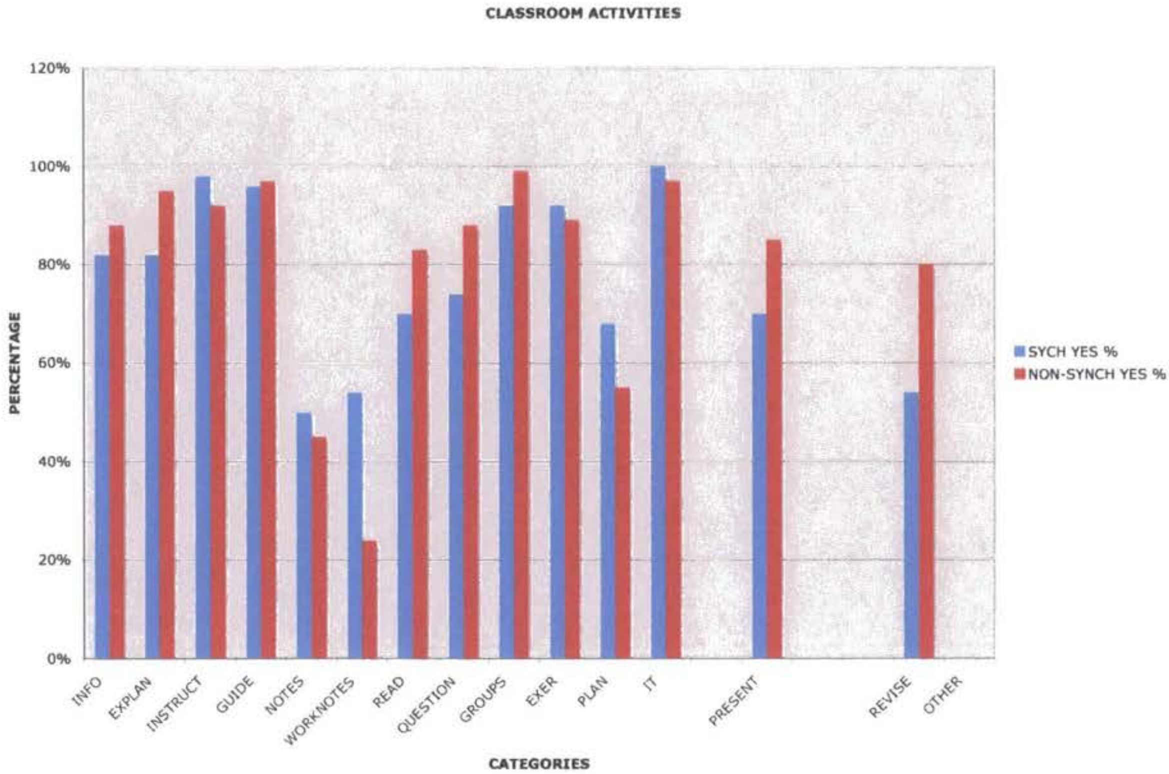


Figure 5-1 Comparison of CLASSROOM ACTIVITIES for synchronous and non-synchronous lessons.

5.2.2 Cognitive Outcomes

Again, each category of cognitive outcome had similar percentage scores in SYNCH and NON SYNCH lessons. Only four (4) categories scored higher for the SYNCH lessons: NEW IDEAS (78%:69%) was expected; PROBLEM (78%:68%) as many of the students' responses in interviews and the BBS suggested that SYNCH tasks that involved solving problems were deemed successful such as Task 3 where students were given the problem of interpreting an idiom; CORE SKILLS (80%:79%) involved communication and information retrieval and all four (4) SYNCH tasks facilitated these, though do note that many NON SYNCH lessons also involved communication and information retrieval, of course, mainly due to the pedagogical approach of the instructor; DECISIONS

(84%:77%) was higher in SYNCH tasks as indeed students were expected to collaborate synchronously which results in negotiation and decision making rather than one student occasionally taking charge so prevalent in NON SYNCH group-work.

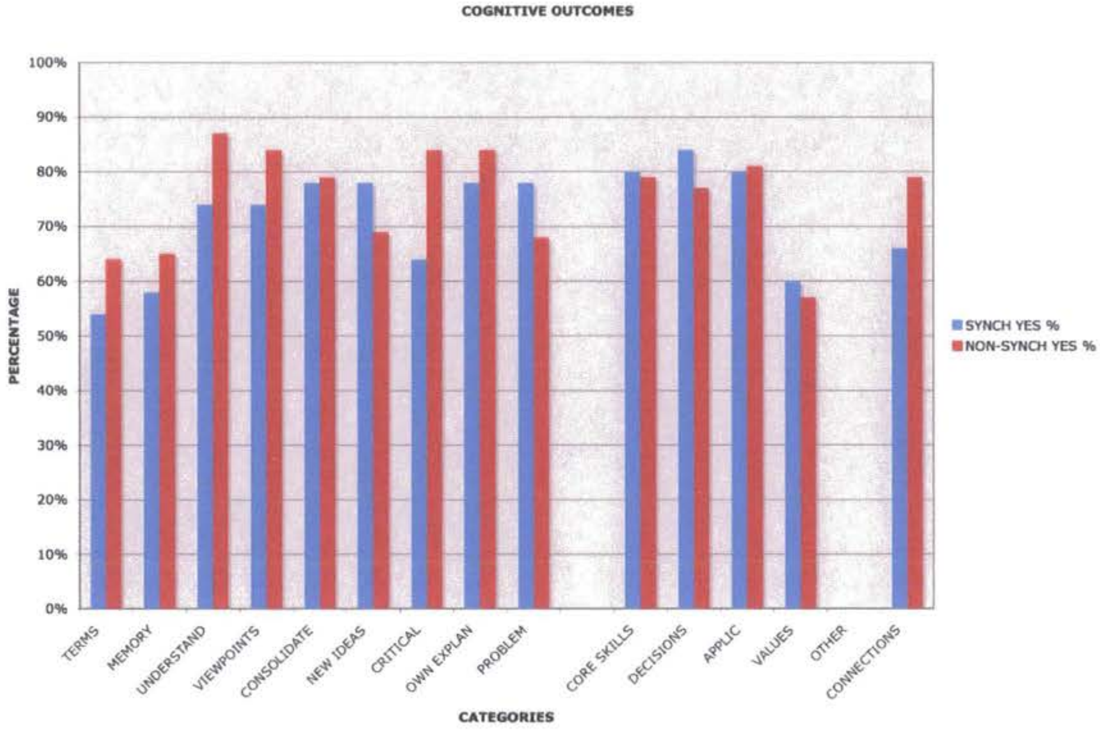


Figure 5-2 Comparison of COGNITIVE OUTCOMES for synchronous and non-synchronous lessons

5.2.3 Interpretation of activities and cognitive outcomes

As shown in Figure 5.1 ACTIVITIES, students indicated they received more information (INFO, 82%:88%) and explanations (EXPLAN, 82%:95%) in the NON SYNCH lessons. This may be due to the students reading (READ, 70%:83%) and revising (REVISE, 54%:80%) in groups (GROUP, 92%:99%) as the instructor worked through the course syllabus. This supports the reasoning that with an instructor physically present the students may indeed be receiving more information and explanations in the NON SYNCH lessons in comparison to the SYNCH scenarios where the instructor acted as moderator, letting the students attempt to discover appropriate strategies before taking action. In the NON SYNCH lessons the students would also have the opportunity to interact with the instructor during an exercise or a break in the class. The aforementioned differences were similarly highlighted by Knipe & Lee (2002).

Students also stated they presented more (PRESENT, 70%:85%) in the NON SYNCH lessons and worked in groups (GROUP, 92%:99%). The former is more likely due to the style of the instructor as he models a discovery and engaging approach to educational technology practices and theory throughout the 12-week course. Groupwork was undertaken in all SYNCH tasks – it was the only way the tasks could have been implemented – but a 92% score recognising such groupwork implied some participants were not included in the group interactions either offline or online. They may have lacked ideas to share with their colleagues so felt isolated. Or maybe one group member dominated the proceedings. This was mentioned by one interviewee (see Table 4.18 – Task 4 Interview 1, Chapter 4 - Case Study Process and Findings: Qualitative Data) though was contextualised as a problem that may occur if synchronous technology was utilised in a school environment. However, it appeared such a concern applies to pre-service teachers but was missed during the task development and implementation. Knipe & Lee (2002) state that, "groupwork at a distance may be beyond the lecturer's control and therefore not as prominent an activity" (p. 309). The data in this Case Study however indicates that groupwork is possible in synchronous technology based tasks where learners are remotely interacting if the conditions of a meaningful task that challenges the students in an authentic setting is created. This is further discussed as in Chapter 6 – Discussion of the Case Study Research, where a proposed framework for such informed synchronous networking is presented.

It also appears that the students received more instructions (INST, 98%:92%) and notes (NOTES, 50%:45%) in the SYNCH lessons. It may be surmised that this was due to the explicit guidance provided throughout the four tasks. Recall in Chapter 4 - Case Study Process and Findings: Qualitative Data, how the students were initially provided with a task (Task 1) after which they reflected upon the experience. They were then involved in developing the resulting task through feedback and recommendations gleaned from the digital capture, the interviews and the BBS postings. Throughout the latter tasks, guidance and moderation by the instructor were requested by the participants. Although all tasks were considered flexible in process and outcome format (note that the intended outcome was made explicit), the students in the SYNCH lessons were provided with notes on how to proceed. Also, during Task 4 the instructor demonstrated (after he disappointingly realised that the students failed to discover) how images could be manipulated in the collaborative document window. As these instructions were provided via the text CHAT maybe this was considered an instruction by the participants. Unfortunately, the researcher failed to raise this in the interviews or BBS.

With reference to the COGNITIVE OUTCOMES, the students reported a higher occurrence of learning in only five (5) of the fourteen (14) categories for SYNCH lessons. The SYNCH tasks allowed the students to experience innovative approaches and ICT usage (NEW IDEAS, 78%:69%) and, as result, began to question their pedagogical beliefs. This was discussed in the latter paragraphs of Section 4.3 Task 2, Chapter 4 - Case Study Process and Findings: Qualitative Data, and supported by this quantitative data. The tasks involved students in role play that presented problems to be solved through cooperative decision making. Although tasks in the NON SYNCH lessons also promoted such cooperation (as reflected by the pedagogy of the instructor), the students recognised the categories (PROBLEM, 78%:68%; DECISION 84%:77%) as important elements in the implementation of informed ICT tasks.

On the other hand, the NON SYNCH lessons appear to offer students the opportunity learn new terminology (TERMS, 54%:64%), and listen and develop alternative points of view (VIEWPOINTS, 74%:84%). This may be a consequence of the students working with their peers in class and discussing the terms and offering opinions during an exercise and later. Such interactions lead to a better understanding (UNDERSTAND, 74%:87%) of the teaching and learning in the ICT context the course provided, and was reflected in the data. Such interactions support learning as a cumulative process where learners draw upon prior knowledge to make sense of new information (Goodyear, 2000). Students are reinforcing their own learning through the process of explaining and sharing their work with others in the group. It appears that sharing and explaining within groups did not occur in the SYNCH tasks so frequently as the NON SYNCH lessons though. Students in the SYNCH lessons were focussed upon the task process and outcome and although they reflected upon the experiences such reflection occurred either with the researcher or on the public BBS. Some opportunity had been provided to further share, discuss and explain what had been learned among the student groups without the instructor present, but more time for reflection is recommended. This interpretation offers an explanation why students considered they developed a greater understanding of the integration of ICT during the NON SYNCH lessons, and presents a weakness in the Case Study that needs to be addressed in further research; that is, provide plenty of time for students to discuss their experience among themselves prior to posting to the BBS or interacting with the researcher. In the context of this Case Study it may be that synchronous technology, due to its immediacy of response and actions, does not necessarily promote understanding. If the non-synchronous technology lessons are deemed by the participants to facilitate a better understanding of the issues of informed use, for example, then this may be due to the opportunities for reflection and sharing through discussion over a period of time, having given thought to the issues beforehand. The use of synchronous technology may not necessarily facilitate, or limit, a level of understanding of posed issues. In contrast, the data in Section 5.5 – Breadth of Learning, reveals a wider occurrence of learning during the synchronous technology lessons. However, the calculation of Breadth of Learning accounts for all ACTIVITIES and COGNITIVE OUTCOMES; as opposed to the single category of understanding (UNDERSTAND). As a result, it is thus apparent that further research that measures learning during SYNCH tasks is needed. Within the context of this Case Study, and indicated in Section 5.4 – Spearman Rho, the quantitative data may lack validity as an independent instrument to draw conclusions, but recall that it is used as one node in a triangulation of data collection.

The students in Chapter 4 - Case Study Process and Findings: Qualitative Data, commented how difficult it would be to implement synchronous networking tasks in their schools, despite the SYNCH lessons having an impact on their pedagogical beliefs. This is confirmed in this quantitative data (VALUES, 60%:57%; CONNECTION, 66%:79%). The latter data suggests that the NON SYNCH lessons appeared to have a greater relevance to current school practice, though the students expressed their reservations of any change in pedagogy by in-service teachers in the foreseeable future (as expressed in the latter paragraphs of Section 4.5 Task 4, Chapter 4 - Case Study Process and Findings: Qualitative Data).

Finally, it may be surmised that a more holistic reason why only 5 of the 14 COGNITIVE OUTCOME categories favoured the SYNCH lessons may be due to a 'reduction in learning' (Freeman, 1998). In the SYNCH tasks there were instances where students were waiting for others to upload text, images or even post text in the CHAT window. Such downtime can lead to a loss in concentration and resulting learning opportunities. One interviewee suggested running two stories simultaneously in order to challenge all students in the network, and should be trialled in future research.

5.3 Teacher and Students

The next collation of data involved comparing the student data with the instructor's data of the SYNCH lessons. This provides a glimpse of what the instructor prepared in terms of ACTIVITIES and what he planned in terms of COGNITIVE OUTCOMES, to that perceived by the students. See Figures 5.3 – Teacher and Students ACTIVITIES, and 5.4 – Teacher and Students COGNITIVE OUTCOMES.

5.3.1 Classroom Activities

The number of categories in which the teacher or the student scored higher were evenly matched at seven (7) each. Taking a number of categories as examples, first the instructor reported he explained more (EXPLAN 100%:82%) but instructed less (INSTRUCT, 75%:98%) in SYNCH lessons, but this was not picked up by the students who reported otherwise. One possible reason may simply be a misunderstanding of the semantics as instruction (to describe how something is done) and explanation (to make something comprehensible) may have been interpreted as synonyms. The perceived similarity of these two categories was not, unfortunately, flagged during the two pilot studies. This therefore presents a weakness in the survey for quantitative data. However, the qualitative data aimed to support the researcher in identifying such instances of possible misinterpretation. Chapter 4 – Case Study Process and Findings: Qualitative Data, provides evidence of an understanding between INST and EXPLAN (i.e. instruction and explanation).

> B: because in half an hour or in one hour we don't know we are doing all this as we go through these we kind of realise that i can apply myself, consolidated, explain. that is quite good.
> Task 4. Interview 2. Data taken from file: Interview5.mov [00:02:27.00] by HISHAM

> The teacher would be at the front of the class, trying to get the students attention to give them proper instructions before they start their work, but the students would already be fiddling with the computer.
> Data taken from CONNECTIONS Post Tasks 3 & 4 BBS by MARIANNA,

These statements only suggest that there was no misunderstanding between instructions and explanations, and that students' responses that teachers instructed more and explained less in SYNCH tasks may indeed hold true. Alas, the qualitative data flags only two participants in this context so, again, reliability of the survey may be questioned. It is thus recognised that Case Studies do indeed have weaknesses but it is anticipated the accumulated evidence in support of this research prevails as this discussion unfolds in the following chapter.

Secondly, although the qualitative data revealed only some planning in the process of implementation of the earlier tasks (Tasks 1 and 2), and was considered a weakness of the tasks that led to the students requesting the instructor to guide more and moderate the task process, the students scored planning higher than the teacher (PLAN, 50%:68%). This may have been due to the students interpreting the success of the SYNCH tasks being due, in part, to their strategy whereas the qualitative data revealed that the process was initially unstructured and confusing. This was reflected in the teacher's lower score.

Thirdly, the teacher and students disagreed on the present category (PRESENT, 50%:70%). The teacher indicated that the students did not have much opportunity to present their SYNCH task outcome (a weakness recognised above in Section 5.2.3

Interpretation of activities and cognitive outcomes). The researcher commented upon this in his BLOG and encouraged students to present their outcome and understanding of the process and product on the class BBS, but the time between the end of the task and the BBS posting may have been up to one week in which the students may have lost the appreciation of their unique experience and thus the comments were not spontaneous which, if discussed, may have led to a broader range of reflections. It is also possible that by obtaining an outcome in the SYNCH task the students recognised it as form of presentation for others to observe. Unfortunately, this was not followed up in the Case Study.

Fourthly, the teacher attempted to blend previously learned material on the course into the SYNCH tasks in order to offer revision (REVISE, 75%:54%). This may be due to the students not recognising the links from each week's lesson that construct the course as the sum of many inter-related parts. The students may have viewed the SYNCH lessons as isolated entities and only in later BBS postings, where the integration of NON SYNCH organisation software (Inspiration) and the SYNCH technology (iStorm) was used in tandem, did the students recognise the blending in the teacher's attempt to revise, reinforce and develop informed ICT usage and good learning.

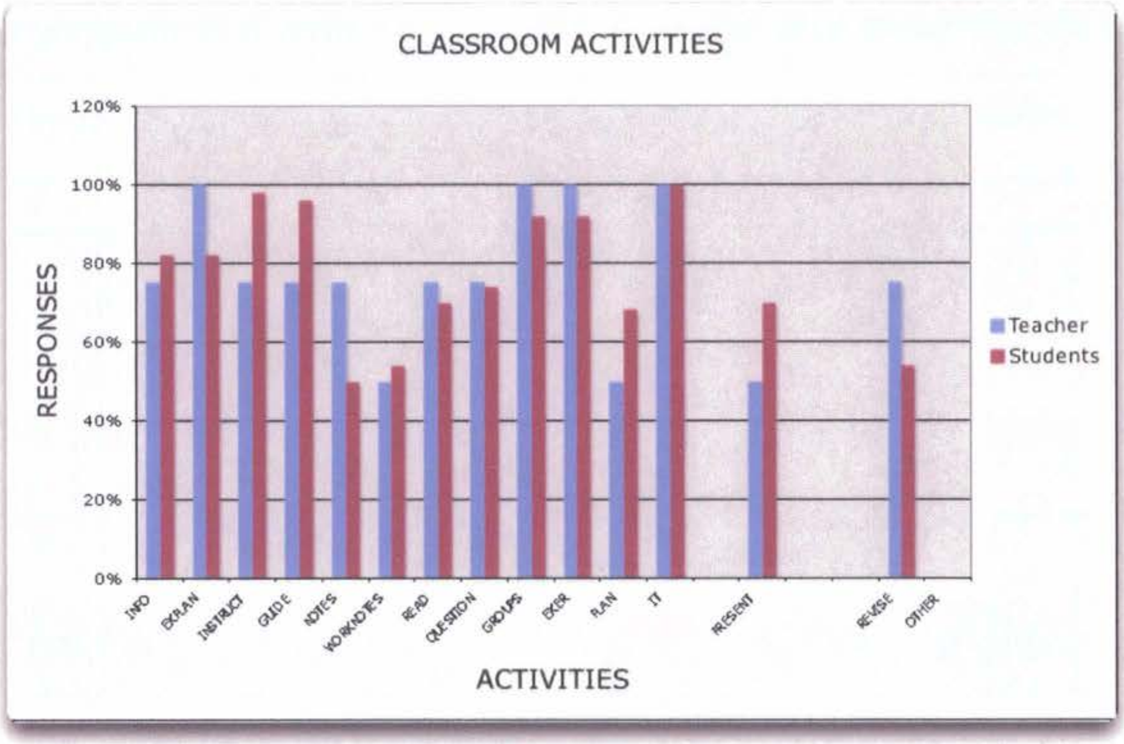


Figure 5-3 Teacher and students ACTIVITIES

5.3.2 Cognitive Outcomes

In all categories, except MEMORY (50%:58%), the instructor scored higher than the students. In general, this may mean that the instructor intended certain cognitive outcomes but were not recognised by the students. To seek an explanation for this disparity the researcher returned to the weekly data in Appendix 2 which revealed that the cognitive outcomes on the later tasks (Tasks 3 and 4) scored higher than the first two tasks (Tasks 1 and 2). This may be interpreted that students were gradually starting to understand how the tasks were impacting on their learning (i.e. they were beginning to reflect more critically) whereas earlier attempts using SYNCH technology may have focussed them more on the IT at the expense of critical self reflection of a task's intended learning. This was confirmed in Table 4.3 Task 1 Negative issues, in Chapter 4 - Case Study Process and Findings: Qualitative Data, where a number of technology related problems encountered in the earlier SYNCH tasks were indeed discussed. These were problems with the network interface, identifying others online, and sudden disconnections which led to impatience and tension within the group being digitally captured. In the later Task 3 there was no indication of frustration or problems with the technology (see Table 4.13 Task 3- Functions in Chapter 4 - Case Study Process And Findings: Qualitative Data). A consequence of this increased generic competency was students becoming more focussed upon the intended learning and their increased academic competency.

This Case Study set out to investigate the impact of synchronous ICT on pre-service teachers and their pedagogy. The qualitative data revealed that the SYNCH tasks were beginning to have an impact on their pedagogical beliefs. In this quantitative data the category that represents beliefs is VALUES. The researcher, through the literature review, anticipated that the student-designed iterative tasks would indeed have an impact on the pre-service teachers. This has partially held true as students scored VALUES overall at 60%. Looking once again at the weekly surveys in Appendix 2 it was found that after Tasks 1 and 2 the VALUES scores were 50% and 40%, respectively. This indicates that some, but little, impact had been made. The data after Tasks 3 and 4 though is much higher at 79% and 71%, respectively. Thus the overall score of 60% is encouraging. This may be interpreted as once the students become comfortable with the technology and the task process then synchronous networking does indeed have some impact on pedagogical beliefs, as revealed by the quantitative data. Supporting this premise, the trainees on this course acknowledged in the interviews that their previous experiences were limited to a more didactic approach to teaching with ICT. Future research is suggested where students are provided more time in a risk free environment, to learn, explore and play with the technology prior to implementing tasks that may lead to some change in pedagogy. The research should develop in stages over a longer period, and preferably within a teacher's school environment. Recall that the ACOT research (see Chapter 2 Literature Review, Section 2.4 Challenging current practice of in-service teachers) took 12 years. This Case Study, in comparison, was a mere 12 weeks.

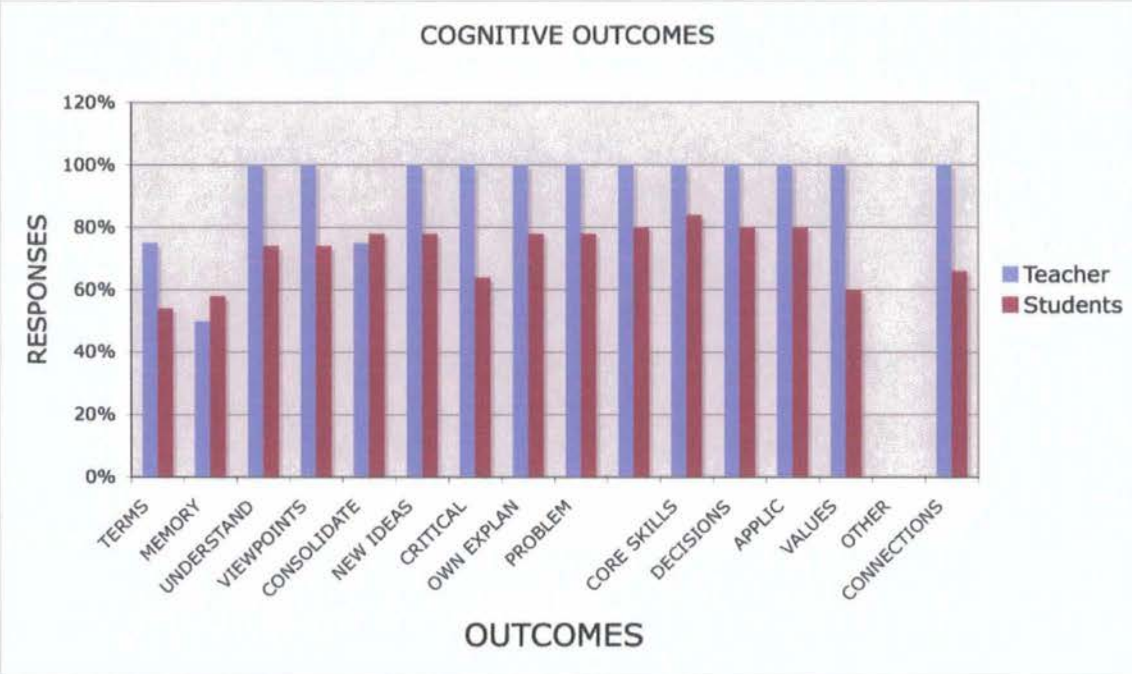


Figure 5-4 Teacher and students COGNITIVE OUTCOMES

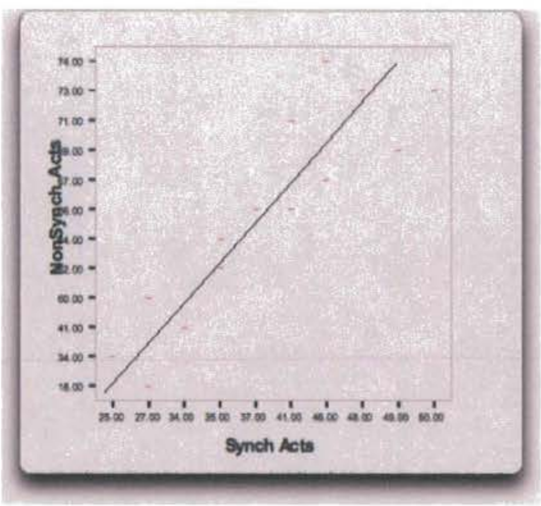
5.4 Spearman rho

Spearman rank order rho was then calculated to see if there was any correlation between SYNCH, NON SYNCH and TOTAL ACTIVITIES and OUTCOMES. Spearman rho is used, "when one wants to examine the relationship of a pair of data without regard for the gaps between adjacent scores in each of the distributions" (Wiseman, 1999, p.233). If the TOTALS ACTIVITIES represent an accumulation of SYNCH ACTIVITIES and NONSYNCH ACTIVITIES undertaken in the pursuit of informed task design and good learning throughout the 12-week course, then there is a difference in the particular activities correlated in SYNCH ACTIVITIES to the particular activities correlated in TOTALS ACTIVITIES. The latter calculation over the 12-week period could be considered better informed as the qualitative evidence revealed a gradual understanding and resultant change in beliefs in pedagogy by the trainees as the course unfolded.

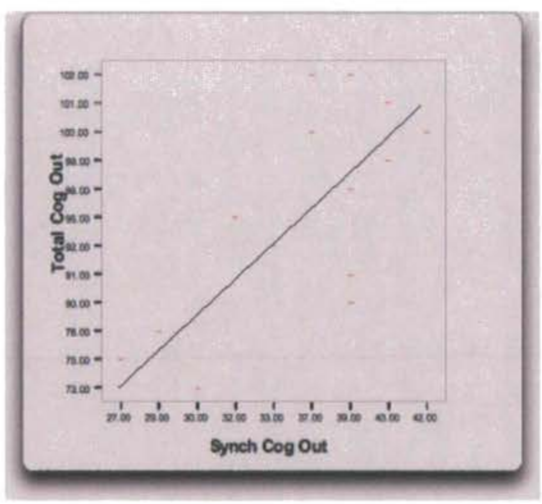
Scatter plots were also calculated (using SPSS software) in order to illustrate the correlations and a sample has been selected to highlight the plots representing high, moderate and low correlations.

		Spearman rho	Considered[36]
ACTIVITIES	SYNCH – NON SYNCH	0.835	high
	SYNCH – TOTALS	0.781	high
	NON SYNCH – TOTALS	0.27	low
COGNITIVE OUTCOMES	SYNCH – NON SYNCH	0.27	low
	SYNCH – TOTALS	0.585	moderate
	NON SYNCH – TOTALS	0.869	high
ACTIVITIES – COGNITIVE OUTCOMES	SYNCH ACTIVITIES – SYNCH COGNITIVE OUTCOMES	0.059	low
	NON SYNCH ACTIVITIES - SYNCH COGNITIVE OUTCOMES	0.136	low
	TOTAL ACTIVITIES – TOTAL COGNITIVE OUTCOMES	0.258	low

Table 5-1 Spearman rho

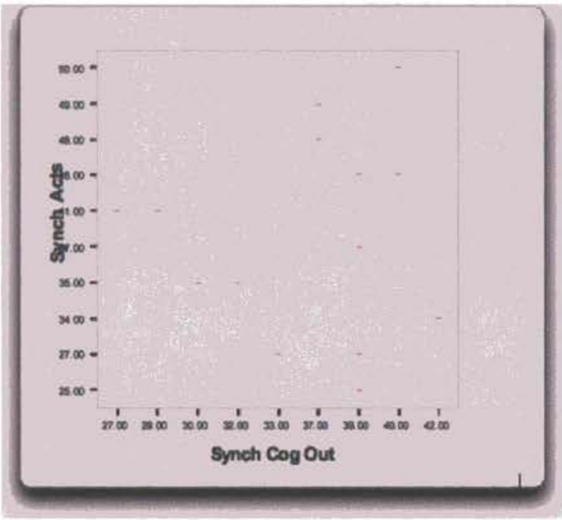


NON SYNCH Activities – SYNCH Activities Scatter plot : high (rho = 0.853)

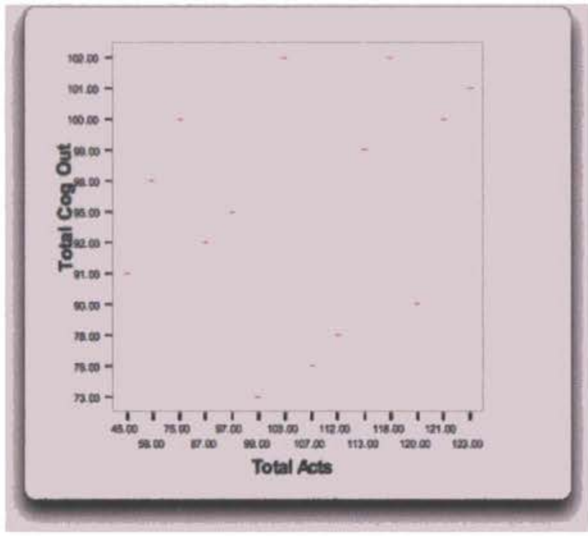


Total Cognitive Outcomes – SYNCH Cognitive outcomes Scatter plot: medium (rho = 0.585)

[36] According to Wiseman (1999)



SYNCH Activities – SYNCH Cognitive Outcomes Scatter plot: low (rho = 0.059)



Total Cognitive Outcomes – Total Activities Scatter plot: low (rho = 0.258)

Figure 5-5 Scatter plots

The Spearman rho data reveals a high correlation between SYNCH and NON SYNCH ACTIVITIES, between SYNCH and TOTAL ACTIVITIES, between NON SYNCH and TOTAL COGNITIVE OUTCOMES, and a moderate correlation between SYNCH and TOTAL COGNITIVE OUTCOMES. These individual activities and outcomes are illustrated in Figure 5.1 - Comparison of ACTIVITIES for synchronous and non-synchronous lessons, and Figure 5.2 - Comparison of COGNITIVE OUTCOMES for synchronous and non-synchronous lessons. However, there is no significant correlation between activities and outcomes.

The data for COGNITIVE OUTCOMES reveals a high correlation (0.869) between NON SYNCH and TOTALS, and a moderate correlation between SYNCH and TOTALS (0.585). There is low correlation between SYNCH and NON SYNCH COGNITIVE OUTCOMES (0.27). Given that trainees began to better understand intended outcomes during the course as they helped facilitate the design of the later synchronous tasks, the TOTALS COGNITIVE OUTCOMES best represent those that the trainees believed occurred. If a high Spearman rho represents numeric superiority then the NON SYNCH lessons were, according to this data, considered more cognitively rich by the trainees. However, this particular quantitative result is questioned by further quantitative data in Section 5.5 – Breadth of Learning, below, revealed SYNCH tasks facilitated a wider breadth of learning.

In addition, the SYNCH – TOTALS COGNITIVE OUTCOMES correlation is moderate (0.585). This states that trainees recognise attempts of learning during SYNCH lessons but such attempts were not as apparent as during the NON SYNCH lessons. One explanation is that trainees were critical of the earlier first two SYNCH tasks (as evidenced in Interviews 1 and 2 in Chapter 4 – Case Study Process and Findings: Qualitative Data) thereby not truly recognising COGNITIVE OUTCOMES at the expense of a focus on the technology. As these tasks amounted to half of the SYNCH tasks then indeed higher scores later would have an impact if more SYNCH tasks had been undertaken. Looking back at the individual weekly graphs (see Appendix 2, graph Week 3 and graph Week 10) it was found that COGNITIVE OUTCOMES scores were much lower in earlier submissions than the later submissions, particularly in memory (50%:64%), consolidate (63%:93%%), new ideas (63%:100%), critical (50%:79%), and connections (63%:86%).

There is a low correlation between ACTIVITIES and COGNITIVE OUTCOMES in both SYNCH and NON SYNCH tasks. The low correlation between SYNCH and NON SYNCH COGNITIVE OUTCOMES suggests that COGNITIVE OUTCOMES perceived by trainees for the technologies and associated tasks are indeed different. This research suggests that this difference exists through this data and that SYNCH tasks facilitate a wider breadth of learning. There is also low correlation between SYNCH COGNITIVE OUTCOMES and SYNCH ACTIVITIES (0.059). Even if this correlation was calculated as high, the result would be a spurious one. Recall that the collected data was totalled each week as trainees agreed to participate in the Case Study research during a regular, high stakes course on the condition of anonymity. This was achieved by not indicating their names on the weekly surveys. To obtain a truer correlation between ACTIVITIES and COGNITIVE OUTCOMES each trainee would have had to insert their name on the surveys so that the data could be collated for each participant, then correlated using the variables of ACTIVITIES and COGNITIVE OUTCOMES. Further research in synchronous networking task design is suggested as it may be pre-supposed that certain activities 'may' promote certain cognitive outcomes; though not demonstrated or validated by this research data.

5.5 Breadth of Learning

Recall that the instrument used to collect the quantitative data was a modification of Knipe & Lee's (2002) survey. In their paper 'Teaching and Learning via Video-conference' they combined ACTIVITIES and COGNITIVE OUTCOMES so that, "some cautious assessment can be given of the quality of teaching and learning" (2002; 307) between comparison groups. This procedure was adopted in this Case Study to also gain a cautious indication of the learning in the SYNCH and NON SYNCH lessons, and was termed Breadth of Learning. Referring to Figure 5.6 – Breadth of Learning, the x-axis illustrates the number of COGNITIVE OUTCOMES (14) and the y-axis indicates the number of ACTIVITIES (14). The mean score of the two indices determined the four quadrants. Note that all the surveys were used to calculate the Mean values of ACTIVITIES and COGNITIVE OUTCOMES[37]. Each respondent was then categorised into one of the four quadrants (refer to Appendix 5 for the detailed calculations). The high:high quadrant represents those surveys that produced a high number of both ACTIVITIES (11 and above) and COGNITIVE OUTCOMES (10 and above). Given these boundaries, 52% of the SYNCH surveys indicated a high occurrence of ACTIVITIES and COGNITIVE OUTCOMES, compared to 43% of the NON SYNCH surveys. With the number of surveys in this quadrant at 59 (i.e. (SYNCH = 26 and NON SYNCH = 33), this represented 47.2% of the total surveys collected (i.e. 59/125), or nearly one half of the total surveys over 12 weeks. This can be interpreted that the overall 12-week course included a variety of teaching methods and cognitive challenges and facilitated the range of learning in classes for both SYNCH and NON SYNCH contexts. This quantitative data can be supported by statements made by participants towards the end of the course. For example, one BBS post read,

[37] Calculations may be found in Appendix 5

> This course has definitely broaden my ideas about teaching and learning with the use of IT. Initially, my idea of using IT in classroom was just using powerpoint presentation and some computer software where students are still considered as passive learners and teachers are the expert for everything. I find that I can now use IT more naturally because I'm beginning to see the IT as an integral part of teaching and learning instead of some added plus or gimmick to impress students. ... now, the questions I ask most of the time are 'How can I make my lesson better than before and how can the use of IT add value to the lesson?' SZELENG

As expected though, not all participants were convinced of the benefits of SYNCH tasks to promote good learning. Looking at the low:low quadrant, 22% of surveys suggested that SYNCH tasks did not facilitate a range of learning opportunities. This scepticism was indicated in Chapter 4 - Case Study Process And Findings: Qualitative Data, where participants mentioned the technical difficulties, the frustration of waiting for other students on the network, being uncomfortable with flexible task process and outcome, and lack of leadership by the instructor. The participants desired instructor guidance, intervention and moderation during the tasks and built this into their latter task designs.

Although the SYNCH tasks scored higher on the high:high quadrant (52%:43%), the close scores have left room to state that a more critical approach to SYNCH tasks is required. Note also how SYNCH scored more on the low:low quadrant too (22%:15%). With the combination of high activities, low outcomes (14%:27%) or low activities, high outcomes (12%:15%) on both quadrants we can see that NON SYNCH task score more. Maybe the SYNCH tasks provide 'affordance' for the cognitive outcomes. Maybe SYNCH tasks simply support NON SYNCH tasks and we should be looking at developing an 'integrated' approach. However, displaying the data in this combined way illustrate that synchronous networking activities can promote a variety of activities and cognitive challenges as demonstrated by a range of learning outcomes.

As stated earlier, by combining the ACTIVITIES and COGNITIVE OUTCOMES in this way represents only a cautious assessment. Further development however is recommended in future research where participants can add their names to the surveys so that the researcher can seek specific clarification of high:high or low:low learning range. This could not be undertaken in this Case Study as participants required anonymity as they were students on a BEd course and would have felt intimidated if the instructor/ researcher knew what they were indicating on their weekly surveys.

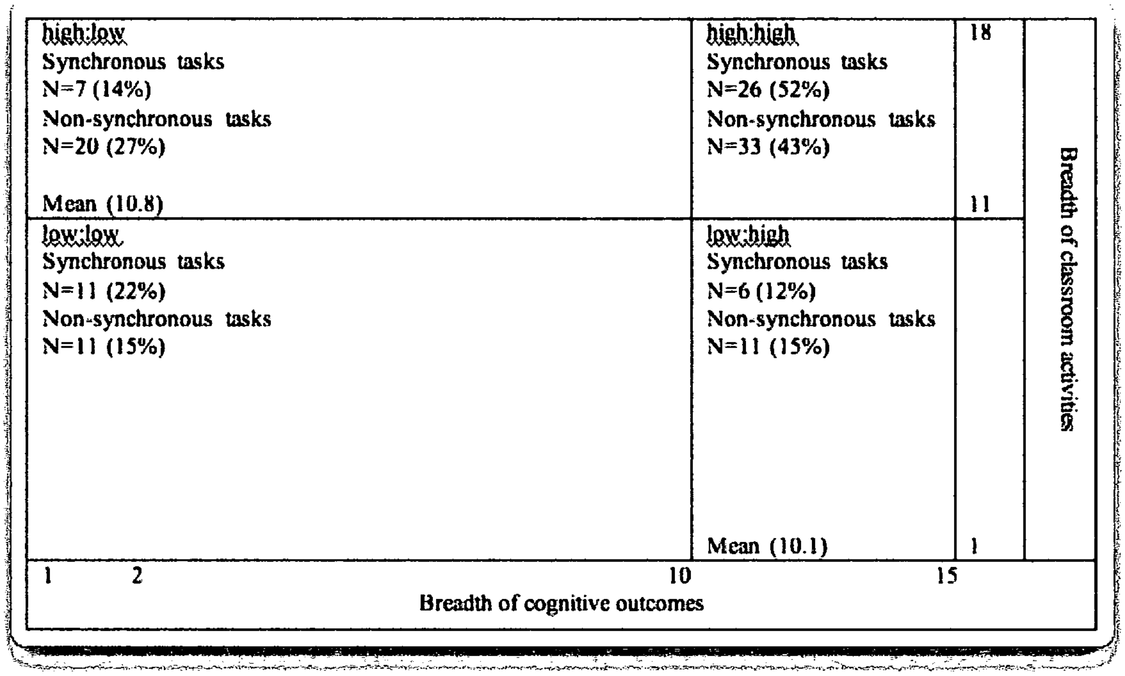


Figure 5-6 Breadth of learning

5.6 Conclusion

It was stated in Chapter 3 –Methodology, that Schuell (1992) categorised learning as passive reception, discovery, knowledge deficit and accrual, and guided construction. Throughout the 12-week course the students would have experienced all four styles of learning. However, in the SYNCH tasks attempts were made to allow opportunities for the students to discover (i.e. learners build unique understandings through personal journeys of discovery). Schuell's categories have not been quantified in this Case Study but used as a guide to help the students become familiar with the different styles of learning. For instance, the SYNCH tasks were designed, with students' input, so that there would be no passive reception (a style of learning that students indicated how ICT had been presented prior to participating in this Case Study and BEd course).

In addition, Goodyear (2001) described ‘good learning’ as a guided process of knowledge construction where learning is active (to make new information meaningful, learners must carry out a variety of cognitive processes), cumulative (draw upon prior knowledge to make sense of new information), individual, self-regulated (increased awareness through reflection and adjust learning approaches to facilitate the acquisition of new knowledge), and goal orientated (outcomes are made explicit). The quantitative data of ACTIVITIES and COGNITIVE OUTCOMES and, to some degree, Breadth of Learning, together with the qualitative data, suggest that the use of synchronous networked technology does indeed support Goodyear’s five processes of knowledge construction (i.e. good learning).

First, the qualitative data supports meaningfulness of task, as indicated in the following BBS post,

> My opinion of teaching has changed from the perception of having to supply or just tell learners with all the necessary information to one where it is more crucial to allow them to construct and negotiate the information on their own. In this way, the **learning will be more meaningful** to them. E.g in a Eng lesson for example, instead of telling them that adjectives are words that describes nouns, **for the learning to be more beneficial to the learners**, they should be **allowed to construct the meaning on their own** instead of the teacher telling. SU LIN

Secondly, the occurrence of SYNCH surveys in the high:high quadrant in the Breadth of Learning support the inclusion of a variety of cognitive outcomes.

Thirdly, the learning was considered cumulative as students were involved in developing Tasks 2 to 4 through interviews and BBS suggestions. The researcher explicitly stated how he accounted for task shortcomings in the design of the following task.

Fourthly, the students reflected after each SYNCH task either with the researcher in a follow-up interview or in text on the BBS. Many of the students adjusted the way they worked through the SYNCH task and indicated that the tasks were impacting upon their pedagogical beliefs. This is discussed in the latter paragraphs of Section 4.3 Task 2, Chapter 4 - Case Study Process and Findings: Qualitative Data. However, this Case Study has been too short to suggest the changed learning approaches and resulting pedagogical practices are permanent. Recall that the ACOT research was 12 years where in-service teachers did indeed change their practice. But the process was long and arduous and went through five distinct stages before researchers would state that ICT was being used in an informed way.

Finally, the learning was considered goal oriented even though the process was flexible in implementation in the SYNCH tasks.

In summary, as all four SYNCH tasks attempted to consider Goodyear's description of 'good learning' and that the quantitative data in this chapter support this assumption, then it may be stated that synchronous networking technology can support good learning if the tasks are explicitly designed to consider Schuell and Goodyear's criteria. In effect, ICT can only be effective if used in an informed way, as demonstrated by the quantitative data in this chapter.

In conclusion, the results from the quantitative data demonstrate that a higher occurrence of learning in 5 of the 14 categories in synchronous networking tasks: NEW IDEAS, PROBLEM, CORE SKILLS, DECISIONS, VALUES. However, in all COGNITIVE OUTCOME categories the difference between SYNCH and NON SYNCH is less than 12% (the maximum difference of 12% is UNDERSTAND SYNCH = 74%; UNDERSTAND NON SYNCH = 86%). One reason why this may be so is that there are indeed many similarities in activities and learning outcomes between SYNCH and NON-SYNCH thus showing that informed technology usage leads to opportunities to create new ideas, problem based learning, decision making and identifying the development of values in teaching and learning. Students appear to be reinforcing their own learning through the process of explaining and sharing of their work with others on the synchronous network (thus reconfirming results found by Knipe & Lee, 2002). Thus, the discussion from this quantitative data, together with the qualitative data discussion in the previous chapter, provides a foundation for the next chapter in which a proposed framework for synchronous inter-networked technology in educational contexts will be discussed.

Chapter 6 DISCUSSION OF THE CASE STUDY RESEARCH

6.1 Introduction

It has been shown that this Case Study research, conducted within the 'Computer Applications in Language and Literature' course, developed the academic competencies of pre-service teachers which, in turn, resulted in a positive impact upon their pedagogical beliefs of informed ICT integration. As the participants were involved in the task design process and implementation they became aware of pedagogical issues previously not discussed, or at least elaborated upon, prior to participating in this research. As a consequence of developing self-awareness of their pedagogical beliefs through reflection and the shared community, a number of key points arose in the construction of informed use of ICT within the context of synchronous networking and communication. The quantitative data, for instance, displayed a difference in activities, cognitive outcomes and breadth of learning using synchronous technology when compared to non-synchronous technology usage. Interpreting both qualitative and quantitative data sets, a framework for informed synchronous networking technology usage to promote good learning has been developed in this chapter. Before revealing the proposed framework, the issue of change of graduating pre-service teachers' beliefs of informed ICT integration is discussed.

6.2 Reflections on teaching and learning

Synchronous networked tasks and associated learning were created in an attempt to modify existing practices or facilitate a radically different approach to teaching and learning. The methodological process involved rudimentary task design. It is recognised though that it will be difficult to prove what is good design for synchronous networked learning (Jones & Asensio, 2000). Given this limitation, this Case Study has been an iterative process and, as suggested by Jones & Asensio (2000), "the product of design are not outcomes of the design itself but of a deeply social and situated set of work practices" (p. 255). Supporting this, the participants were therefore involved in designing the latter synchronous inter-networked tasks, and throughout the 12-week course developed a community that reflected, shared and explained their evolving personal beliefs and understandings of ICT-enabled pedagogical practices. It was seen from the on-going development of the tasks in Chapter 4 – Case Study Process and Findings: Qualitative Data, that the beliefs of the participants emerged and altered through participation in synchronous networked activities that occurred during the task process. This will be further discussed in detail below through the evidence of the reflections by the participants during the research period. By reflecting each week via the surveys and BBS postings the participants began to change their perceptions of what is possible with ICT and, in particular, synchronous networking through the application of tasks developed with their cooperation. Moreover, students learned by sharing and articulating ideas, linking these ideas to their own experiences, engaging with tasks, and from exposure to different learning approaches. The breadth of learning may be interpreted as evidence to support this assumption given that activities and cognitive outcomes were higher during synchronous inter-networked tasks (see Section 5.5 – Breadth of Learning). It is also suggested that a kind of architecture has arisen from this Case Study and will be discussed later in this chapter and presented as a proposed framework for synchronous networked technologies and good learning.

It is interesting to note that Steeples, Jones & Goodyear (2001) attempted to develop a pedagogical framework and apply it in the training of Higher Education staff in promoting online learning. A number of their findings are supported by this thesis, in particular, tasks require degrees of openness (i.e. flexibility), and learners' interpretation of task specifications and the ensuing activities are personal responses to the task and may be unpredicted. Given that learners therefore make their own interpretation of a task that may lead to successful completion of a stated objective (or outcome), such user-centred ICT environments need to be designed for consideration of the anticipated activities therein.

Steeples, Jones & Goodyear (2001) go on to state that, "Understanding what learners do is a cornerstone of good design when it comes to environments for networked learning" (p.333). To find out what the participants thought they did throughout the synchronous inter-networked tasks, each participant reflected upon the cognitive outcomes believed associated to each task. The qualitative evidence (see Chapter 4 – Case Study Process and Findings: Qualitative Data) categorised these reflections of cognitive outcomes into three broad competencies: generic, epistemic and declarative (see also Section 3.7 - Instrument,). CONSOLIDATE, NEW IDEAS, and CORE SKILLS were deemed generic competencies that are currently expected of graduates and are linked to what Goodyear (2001) calls 'transformative potential'. UNDERSTAND, VIEWPOINTS, and OWN EXPLAN represented declarative conceptual knowledge and applying such knowledge in problem solving or arguments. Epistemic fluency, where learners are required to be flexible in their use of knowledge (Morrison & Collins, 1996), was represented in this Case Study by APPLIC, VALUES and CONNECTIONS.

Recall that all participants completed a survey, and a personal reflection on the class BBS, after each synchronous task was undertaken. By establishing a set of competencies that can categorise these reflections in terms of cognitive outcomes, an interpretation of the process supported by synchronous networked technology, related tasks and associated learning that facilitates changing beliefs in ICT-based pedagogy can be discussed. As shown in the quoted reflections below, the categories within each competency are tagged according to the quantitative data survey categories. This will allow for cross-referencing between quantitative data and the post- and during- task qualitative data; i.e. the triangulation of data. Some of the comments by the participants can be placed under one or many categories. However, the selected category was chosen within the context of the situation (reference to task, reference to learning, reference to pedagogy, or reference to external factors such as school syllabus constraints) in which the comment was submitted. It has also been shown that synchronous networked learning can support teacher training through, as Goodyear (2001) states, "the collaborative creation of working knowledge" (p.51). Thus, collating participants' reflections during the iterative process is the hallmark of this Case Study research that, in effect, attempts to create such working knowledge.

6.2.1 Generic competencies

In the adaptation of Knipe and Lee's (2002) Instrument used in this Case Study, generic competencies were represented as follow;

Generic competencies	
CORE SKILLS	Learning IT, communication, application of number skills, info retrieval
NEW IDEAS	Generating and combining new ideas through questions, discussion and brainstorming
CONSOLIDATE	Consolidating previously learned materials

Table 6-1 Interpretation of selected competencies

The comments reveal that even in their graduating year, pre-service teachers are concerned about their confidence in using ICT practically and pragmatically. This is not surprising considering that the literature review revealed that 67% of USA and 47% of Singapore graduating teachers similarly lacked confidence after their teacher training degrees (see Section 2.5 – Preparing Pre-service Teachers to Use ICT). For instance, it appears that early on in the Case Study the first opportunity to reflect allowed deeply held frustrations to emerge (see ZURA's comments below). ZURA explicitly states that she believes teachers are not trained adequately to use technology in the classroom. She expresses concern about a lack of knowledge of a technology's capabilities and an understanding of how to integrate ICT into her teaching practices. She wonders how teachers can be expected to support pupils' use of technology in education if teachers themselves lack confidence and, even worse, use technology without any understanding of its effectiveness or appropriacy.

Cognitive Outcome	When occurred	Participant's reflection
CORE SKILLS	Post Task 1	Putting the technical problems aside, as much as the MOE/schools emphasized that teachers are to make full use of IT, ANOTHER BIG PROBLEM arises! **Teachers ourselves are not trained how to use IT!** Not only do some teachers themselves are **not taught how to make lessons using IT** nor are we equipped with the latest information of IT 's capabilities, we are faced with challenges such as making use of IT in our lessons. SO, the question is: "**How well can we make a lesson with**

		IT such that students gain/learn something out of it at the end of the lesson?" How can we show/share with students the wonders of IT and teach them **if we are ignorant ourselves in the first place?** Teachers have to be taught how to make use of IT before they can embark on how to use technology to their own benefit to maximise learning. A teacher has to be learned and confident of using IT to make the lesson a fruitful one for students. So **the big mind boggling question here that i am faced with is: "Are we ready?" or "Are we just supposed to do it blindly for the meantime"?** ZURA

As the course unfolded, the trainees practical ICT competencies increased and a wider range of ICT skills adopted. However, as revealed by SZE LENG below, the trainees were considering 'why' and 'where' ICT fit into a lesson not necessarily as an add-on but in such a way that makes the technology essential and worthwhile. SZE LENG's comments suggest that, after Tasks 3 and 4, the trainees had some understanding of ICT effectiveness and appropriacy so lacking at the beginning of the Case Study, as highlighted by ZURA above. In the post Task 4 interview ZURA explained how her beliefs in pedagogy had changed over the 12 weeks ([00:07:03.00] "... this kind of lesson will be very interactive for students" See Table 4.19 - Task 4 Interview 2) but remained cautious in being provided opportunities to implement her new pedagogical beliefs due to external factors such as lack of support and needing to conform to established school practice ([00:09:53.00] "... they won't like penalise us for this is unauthorised, this is not supposed to be, and what s the one we are supposed to do?" See Table 4.19 - Task 4 Interview 2). SZE LENG and ZURA have revealed an increase in generic competency represented by their increased ICT confidence not only in the technology but in its implementation in educational contexts. In addition, they are willing to critique current and proposed future practice; something, they stated, they had never been provided with an opportunity to do prior to this Case Study.

Cognitive Outcome	When occurred	Participant's reflection
CORE SKILLS	Post Tasks 3 & 4	I find that I can **now use IT more naturally because I'm beginning to see the IT as an integral part of teaching and learning** instead of some added plus or gimmick to impress students. For instance, initially, when I was asked to design an IT lesson, my questions were 'where can I insert Powerpoint, software and other types of IT resources?' but **now, the questions I ask most** of the time are **'How can I make my lesson better than before** and how can the use of IT add value to the lesson?' SZE LENG

One of the major considerations in the success of ICT in education (and considered in this Case Study) is the need to promote a community of practice (Scardemelia & Bereiter, 1996). This need for such a shared learning community, beyond enforced collegiality, was expressed by preciaLILY (see below) who emphasised the benefits of saving time, decreasing workloads, and obtaining technical support from like-minded teaching colleagues. This community of practice need not necessarily be solely for the domain of professionals but can be utilised to support students. In fact, to the instructor/ researcher the trainee teachers/ participants were, in effect, his students. They developed the shared community on the class BBS. The instructor contributed but his submissions were minimal as most of his comments were posted in his weekly BLOG. The shared community by students for students was noticed by preciaLILY who became aware of the advantages of collaborative practice, exemplifying how pupils across distance at different schools can be provided opportunities to work together and benefiting from enhanced interactions made available through synchronous networking technology, such as iStorm, and informed tasks. She went on to state that she was initially unaware that such communicative tasks could be implemented but involvement in this Case Study allowed her to become better informed, but also be aware of the ingredients needed for successful implementation.

Cognitive Outcome	When occurred	Participant's reflection
CORE SKILLS	Post Tasks 3 & 4	The **challenges for us teachers** are to find ways in which we can **justify our work** using technology, **persevere** on when initial setbacks due to technological malfunction happen as well as promote the use of using IT in language teaching and learning when we go out into the teaching world. **We can do this with the help of like-minded colleagues** as **we collaborate to share** our IT-based lesson plans, and this will also serves to **save time, share resources and decrease workload.** PreciaLILY Student activities no longer have to be done individually as I **realised the importance and significance of student activities being collaborative and interactive.** For instance, using istorm is an innovative way of **enhancing interaction and collaboration** amongst the students, even across **different institutions.** Previously, **I do not think that this is possible in reality but now i have come to know that it can be done.** =) preciaLILY

New ideas were also being propagated after the participants' first encounter with a synchronous networking task. The exposure to new technology and a new way of communicating among pupils set participants considering alternative tasks. The previous post by ZURA (above) indicated some pessimism about ICT usage. GRACE however saw early on the potential for synchronous networking tasks (see below). GRACE suggested a multinational task where pupils develop text on the main document and use the CHAT window to discuss the text, and suggest modifications, possibly, for a more globalised outcome (such as a story or a poem, or a list of needs and desires). These two very different reflections represented the feelings of participants who were unconvinced and those who could visualise the potential of synchronous networking. The initial interviews and corresponding surveys revealed that participants were indeed cautious in their optimism as they focussed more on the technical frustrations at the expense of teaching and learning in the initial tasks. As the participants became more involved in stating explicitly what needed to be done to improve the next task, a task they were to be partly responsible for designing and implementing, they needed to consider new ideas that would support pupils' learning given the constructivist pedagogy represented as a major factor for informed use of ICT.

Cognitive Outcome	When occurred	Participant's reflection
NEW IDEAS	Post Task 1	I think the common document (the one that can be put up for grabs) could be used to put up consolidated information of a given topic for the chat group. For eg, a few **students from Malaysia, Philippines, Thailand, Indonesia and China** may be given **a topic** on their own culture or country **to prepare**. After which, they can put it up on the common document during the chat. The smaller **chat window** could be used to **ask questions** about what has been put up in the common document. After all those clarifications, **the common document may be edited along the way** to make it clearer, more comprehensive and informative. The finalised copy can be saved and printed out for display and shared in each student's classroom. GRACE

Finally, perseverance for consolidating information became another pre-requisite for successful ICT usage, in particular with new technologies such as synchronous networking, and represents another category in the increased generic competency of the participants. The input to the synchronous task designs eventually resulted in learning environments where students were more focussed upon the process and outcome of the learning objectives rather than the technical issues. The realisation of lesson outlines that incorporate a task to promote good learning, together with a supportive teacher with a constructivist pedagogy, was confirmed by HUI MIN (see below). She states that the groups became more focussed and considered other group's work more carefully in the latter tasks. However, she also explained that the teacher needs to act as moderator and be flexible in design and implementation. Developing such awareness of a constructivist pedagogy that can be promoted through informed use of ICT was indeed a key objective of the 12-week course that provided the context for this Case Study, and it is suggested that the synchronous tasks helped consolidate this awareness of pedagogical practice.

Cognitive Outcome	When occurred	Participant's reflection
CONSOLIDATE	Post Tasks 3 & 4	**Groups are more focused in the information** that that they put up and they **take more time in looking at the postings done by others.** Therefore, i guess the **onus is on the teacher to ensure that student activities work and** when they do not, the teacher will have to take it upon himself/herself to **make the necessary adjustments.** KWOK HUI MIN

In summary, Goodyear (2001) refers to these generic competencies as transformative potential, represented by a willingness to learn, to have new ideas, and to consolidate previously studied information. It may be stated that the participants in this Case Study developed generic competency as they reflected throughout the 12-week period. The synchronous technology tasks presented a kind of marker that allowed the researcher to extract specific comments from the participants' postings and interviews that were put to practical use in the development of the proceeding tasks. The benefits and success of the synchronous networked tasks may be interpreted as participants increasing their technology skills as they utilised the innovative collaborative software known as iStorm, their communication skills online in both synchronous CHAT mode and synchronous document development, and new ideas that were forthcoming later in the research. The synchronous networked tasks also allowed participants to reflect and consolidate previously learned information (prior to participating in this course and Case Study) such as lesson outline development and roles of teacher and pupils in the learning environment.

6.2.2 Epistemic competencies

Epistemic competencies	
APPLICATION	Learning to relate theoretical knowledge to own experience, to applications and /or to specific examples
VALUES	Identifying the values underpinning areas of enquiry, developing a sense of own values
CONNECTIONS	Making connections between synchronous networking tasks and school-based classroom practice

Table 6-2 Interpretation of selected competencies

Epistemology studies the nature of knowledge, its presuppositions and its extent. Epistemic competencies display flexibility in utilisation of knowledge (Morrison & Collins, 1996) and are represented in this Case Study by APPLICATION, VALUES and CONNECTIONS. Looking at the participants' reflections in detail it appears that epistemic fluency, where participants became more flexible in using that previously learned and critiquing prior knowledge, was more apparent in the later submissions. This observation of the qualitative data is also supported by the quantitative data. For instance, the percentage scores given to the three associated categories of APPLICATION, VALUES and CONNECTIONS after Task 1 were 88%, 50% and 63%, respectively. After Task 3 the respective scores were 93%, 79% and 71%. The following text represents an interpretation of the participants' postings to reveal a development in epistemic competency.

APPLICATION is relating theoretical knowledge to experience and pragmatic application. For example, the emphasis on students' learning appeared many times in the post Task 3 and 4 contributions. Such awareness revealed a focus away from teachers teaching (as viewed in Generic competencies, CORE SKILLS) to the learners ownership of learning. For example, SHANTHI (see below) states that students need to take responsibility for learning while the teacher should ensure the students are intrinsically and extrinsically motivated to do so through the provision of interesting and authentic tasks. SHANTHI continues by observing the benefit of affordances that synchronous technology based tasks, using software such as iStorm, may facilitate, and that these affordances should be considered positively. In effect, SHANTHI is displaying a pragmatic link to her understanding of the constructivist pedagogy demonstrated throughout the 12-week course and the synchronous tasks attempted to promote. Although there is no explicit reference to particular literature by SHANTHI, it is reasonable to interpret that there is a relationship between her understanding of the academic literature to the practical benefits of applying student-centred pedagogy. Such an assumption may be supported by LI CHING's comments (see below) as she relates the use of synchronous technology to the role of the learner and instructor. LI CHING, like SHANTHI, is displaying awareness of the applicability of student-centred learning as they progress throughout the course (and Case Study research). Similarly, HUI MIN comments upon how the synchronous technology tasks allowed students to take responsibility as a group, with the teacher stepping back. With reference to the teacher, and in applying the experience of synchronous technology tasks to a consideration of informed ICT integration, HISHAM (see below) emphasises the key role of the teacher in providing clear objectives and learning outcomes, as well as being able to justify the use of technology, if student-centred learning is to be successfully implemented. The onus is on the teacher to provide opportunities for students to work together. HISHAM is thus displaying an awareness of informed ICT usage so prevalent in the literature that supports good practice. As stated by ZURA in Section 6.2.1 Generic competencies, many pre-service teachers end up using technology for the sake of it and have no clear understanding of the reasons. SHANTHI and HISHAM, on the other hand, are displaying a development of application of ICT and may therefore be considered to have developed epistemic competency.

Cognitive Outcome	When occurred	Participant's reflection
APPLIC	Post Tasks 3 & 4	**I have learnt that** student activities should be designed in such a way that learning takes place naturally, **Students should be able to take charge of their learning.** There should be knowledge formation and transformation too. Moreover, the **activities should be authentic and interesting.** For example, the use of I-storm. Students not only do the task but they have to solve certain problems that they encounter. Hence, students learn **problem solving skills, communication skills** and social skills **on top of academic knowledge.** SHANTHI
APPLI	Post Tasks	**Student activities have become more student-centred and collaborative.**

C	3 & 4	They are given more freedom to voice out their opinions during the activities. the **teacher is very much 'behind the scene'** LI CHING
APPLIC	Post Tasks 3 & 4	the teacher should have **clear objectives** and **learning outcomes** set for the IT task before designing a lesson. **there must be a valid reason for the inclusion of IT** in the lesson (to add value to learning and teaching). IT can be used to foster collaborative learning ie. students can work together using i_storm, Inspiration. however, **teachers have to create opportunities** for students to use the technology before students can fully tap the benefits of learning using IT. HISHAM
APPLIC	Post Tasks 3 & 4	I must say that i am getting more impressed with using istorm as a student activity. It is interesting to see how **students take charge of their own work** and actually get the other groups to respond when they are lagging behind. The **teacher does not have to step in** and continue get students to contribute. **Instead, the other groups take it upon themselves to move along the task.** HUI MIN

Developing an awareness through the practical application of roles in the synchronous tasks, the participants revealed an appreciation of a change in the teacher's role from that of information provider to that of a facilitator of knowledge construction. This is supported by the literature through the ACOT research discussed in Section 2.4 - Challenging Current Practice of In-Service Teachers. Such awareness may be interpreted as a fundamental change in values of the participants; in other words, their pedagogical beliefs were being questioned as they reflected upon the synchronous tasks. For instance, SU LIN (see below) explicitly states that her beliefs in student activities using technology and the corresponding role of the teacher have changed as a result of participating in the synchronous tasks. SU LIN continues to explain her recognition of the importance of refraining from simply informing students (that is, being an information provider) to supporting students in their construction of knowledge.

Cognitive Outcome	When occurred	Participant's reflection
VALUES	Post Tasks 3 & 4	**My opinions of student activities have changed** in that I have realised that IT e.g. Inspiration and iStorm can be used to **facilitate student centred learning** as opposed to only as a source (Internet) where they can search for information. Additionally, the **teacher** will also have to learn to assume the **role of a facilitator** as opposed to expecting 'absolute' control. **My opinion of teaching has changed** from the perception of having to supply or just tell learners with all the necessary information to one where it is more crucial to **allow them to construct and negotiate the information on their own**. In this way, the learning will be more meaningful to them. SU LIN

Like the ACOT longitudinal research, the participants in this Case Study appeared to be developing academic competencies in stages. However, it is difficult to determine each particular milestone that represents a step from one stage to another. Such detailed staging was outside the scope of this research but is recommended for future study. The stages exemplified below are quite boundary-less and only utilised as a guide to highlight progression. For instance, after the first synchronous task many of the participants remained unconvinced about integrating synchronous networking into learning environments. LI CHING (see below) is initially cautious and suggests not using technology at all. However, after the second task it appears that she has a positive view of ICT integration but, at this stage, suggested a change of mindset being needed, possibly due to her previously held values as a teacher being questioned. After Task 4 she recognised the need for teachers to support a constructivist pedagogy, and acknowledged that her beliefs in pedagogy had changed throughout the course of this Case Study.

SZE LENG appears to disagree with LI CHING's first comment on the integration of technology. SZE LENG recognises the benefit of technology to promote inquiry, creativity and communication but agreed that to utilise ICT in an informed way required a change in mindset. In effect, SZE LENG may be considered to be at a higher stage of epistemic competency than LI CHING early on in the Case Study. It may be stated that the pre-service teachers were becoming aware of a more constructivist pedagogy and its benefits, unlike their previous learning experiences and teaching practicum at the teacher training institute where, it was suggested, a more teacher-centred approach to ICT adoption prevailed.

SU LIN's comments agree with this interpretation and she goes on to state that, as graduating teachers, they will have to be prepared to move out of their 'comfort zone' if technology is going to be used in an informed way to help their pupils learn. Teachers 'letting go' in order to promote ownership of learning responsibilities to pupils was also brought up by SZE LENG who stated that such a step required bravery and to discard many previously held beliefs in pedagogy.

It was stated that any apprehension to change can lead to a lack of confidence which, in turn, results in the teacher not truly exploiting the strengths of the learners. LOSHINI (see below), for instance, acknowledged how her own apprehension about technology in the classroom became a detrimental effect on her own students at school. It is interpreted that such realisation of bridging teaching styles and distance between learner and teacher was recognised through reflections after undertaking synchronous tasks. It is suggested that this self-realisation is further evidence of a change in the trainee's beliefs in teaching and learning using ICT through synchronous networking.

Finally, preciaLILY provides two suggestions: take risks and persevere. As discussed earlier, the ACOT research took 12 years and the development of in-service teachers using ICT that impacted upon their teaching and their pupils learning was long and arduous. It may be stated that this Case Study research supports such, albeit obvious though not often acknowledged, observations.

Cognitive Outcome	When occurred	Participant's reflection
VALUES	Post Task 1	**we should not be too quick to embrace** everything that has to do with **IT** but take a **step back** to **evaluate** its pros and cons **before we incorporate IT into the classrooms.** LI CHING
VALUES	Post Task 1	I realize that I fell into the trap of letting technology taking precedence over pedagogy when **my supervisor insisted on powerpoint presentation** and allowed the lesson to be **too teacher-centred.** I agree that computers are **best-used for inquiring, creating and communicating.** The question is then 'How?' and to answer this, we have to not only improve our IT skills but **change our mindset** on teaching and learning. SZE LENG
VALUES	Post Task 2	**Our mindsets** about how we usually plan our lesson **made it difficult to infuse IT.** LI CHING
VALUES	Post Task 2	In a way, I feel that it brings home the message that perhaps to be more effective teachers, we have to as mentioned in last week's lesson adopt a different kind of approach in planning out our lessons and be prepared to change our mindsets. This would mean that we have to be prepared to **move out of our comfort zone.** SU LIN
VALUES	Post Task 3 & 4	I feel that this course has 'enlightened' me on the methods of teaching that I was accustomed to previously. **Teaching style has become less rigid** and **learning for students is very much self-directed. One example is the use of i-storm,** where students are able to work independently even without the presence of the teacher. Student activities have become more student-centred and collaborative. They are given more freedom to voice out their opinions during the activities. the **teacher** is very much **'behind the scene'.** LI CHING
VALUES	Post Task 2	**I think to change our mindset** and approaching in planning is going to take a very **huge and brave step, especially for us new teachers.** As Li Ching mentioned before, our group was too focused on the structure of the lesson plan and we got stuck on trying to infuse IT. Eventually, we did change our lesson plan to make it more flexible and student-centred. The transition from a more structured lesson plan to a more flexible one **involved the discarding of a lot of security blankets and assumptions on our part.** SZE LENG
VALUES	Post Tasks 3 & 4	there are some areas in **my pre-held beliefs that changes have to brought about.** For example, pupils can be and should be trusted with technology. i have always been wary of allowing pupils to handle equipments that i deemed too advanced or complicated for their handling. I realise now that this belief was held simply because i, personally, found it such and was uncomfortable using them. Thus **i was projecting my apprehension of IT onto students.** LOSHINI

VALUES	Post Tasks 3 & 4	The truth is that we will face problems along the way of using IT in our teaching, but **our mindset should be that of a willingness to take risks and persevere** till the end. Like the moral of the story that we come up with: If there is a will, there is a way. preciaLILY

The trainees next had to make connections with their school situation; i.e. could synchronous networking be applied in their Singapore classrooms? The main issue was classroom or computer lab management with 40 pupils and no network management software[38] installed. There was thus cautious optimism so long as one planned thoroughly. As stated in MARIANNA's lengthy reflection (see below), her practicum experience of students using technology did not give her much confidence as she observed an in-service teacher failing to maintain control of a class let alone facilitate any meaningful learning. Through the modelling and direct experience of student-centred tasks using synchronous technology (and, to be realistic, non-synchronous technology throughout the 12-week Case Study period) MARIANNA became optimistic about applying her knowledge to the classroom environment.

Cognitive Outcome	When occurred	Participant's reflection
CONNECTIONS	Post Tasks 3 & 4	**During the practicum,** the times when the CT brought the students to the **computer lab were always chaotic.** The teacher would be at the front of the class, trying to get the students attention to give them proper instructions before they start their work, but the students would already be fiddling with the computer. Those lessons **leave me feeling very skeptical** about allowing students to learn by using computers. However, through the introduction of programs like i-storm, Inspiration and Hot Potatoes, and the **modelling in class of how student activities** could be done **when using IT,** I realised that it is possible to retain some **degree of control over the students' attention.** However, issues like the fact that we're adults and the arrangement of the computers are in the way such that group activities can take place more easily (as opposed to in schools where the computers are arranged in rows and the labs and there are 40 restless kids), I'm still not too sure that I would be able to manage a class in computer lab and complete all that I want to do in a given amount of time. But I guess this **confidence could come only with experience.** MARIANNA

Then the issue of the stakeholders was raised. The trainees felt they were compelled to meet the demands of a school system that rewards high test scores, of parents that demand schools cater to the need for high test scores, to Ministry slogans such as 'Teach less, Learn More' (MOE, 2004), and a teaching belief that hopes for a learner-centred

[38] Apple Remote Desktop lab management software (http://www.apple.com/server/) was used in this Case Study. Windows XP equivalent is Teach by JungleByte (http://www.junglebyte.com/teach.html).

education. LOSHINI (see below) raises the concern of many inexperienced pre-service teachers. They feel compelled to meet the demands of 'teaching to the test' yet desire to develop a constructivist pedagogy knowing how much more beneficial the latter can be to learners who need to develop independent learning skills for life beyond the sanctity of school (and ironically supported by the Singapore government's decree on enhancing human capital, discussed in Section 2.2 The Singapore Context, in Chapter 2 – Literature Review).

Cognitive Outcome	When occurred	Participant's reflection
CONNECTIONS	Post Tasks 3 & 4	when **we have to teach pupils** who are about to take a **high stakes exam**, we might feel the need to fill pupils with all the necessary, and more than necessary, information. **I personally would not be comfortable** with giving pupils the luxury to explore, experiment and discover knowledge for themselves at such instances. **We have to take into consideration accountability to parents, Principals and school standards**. LOSHINI

In summary, epistemic competency was developed by the participants. The postings quoted and interpreted above reveal that pre-service teachers could make connections to their school classrooms. Some, like MARIANNA, were optimistic while others, like LOSHINI, were concerned about external factors. However, all could make knowledgeable connections in applying synchronous networked tasks thus illustrating a positive development of epistemic competency.

6.2.3 Declarative competencies

Declarative competencies	
VIEWPOINTS	Learning about alternative theories or points of view on the same subject
CRITICAL	Learning to be critical, to question evidence and/or assumptions and to evaluate arguments
UNDERSTAND	Understanding concepts, interpreting facts, analysing ideas and arguments

Table 6-3 Interpretation of selected competencies

VIEWPOINTS, CRITICAL and UNDERSTAND represent declarative conceptual knowledge. In effect, the ability of students to present and communicate information that make a statement. It has been demonstrated throughout this Case Study that the participants were provided with ample opportunities to express their viewpoints and be critical; on the BBS where participants had plenty of time to reflect on their experience using synchronous technology, the post task interviews where participants reacted to questions from the researcher and then developed into a discussion, and the digital capture where students spontaneously volunteered some viewpoint or critique of an instance during the synchronous task process. The researcher also presented his viewpoints after the participants' contributions in order to answer specific queries, inform the participants of related literature and existing practices (as the participants were students on the BEd course), and to facilitate the design of following synchronous tasks.

The quantitative data for the previous two academic competencies (generic and epistemic) was quite specific in its numerical increase from start to finish of the Case Study research period. However, the quantitative data for declarative competencies is not so uniform. For instance, from Task 1 to Task 4: VIEWPOINTS (88%:74%), CRITICAL (50%:64%) and UNDERSTAND (75%:74%). It may be interpreted that declarative competency represents students making specific statements about specific experiences at a specific time given a specific context. Looking at the quantitative data for the aforementioned three categories over the 12-week course it does appear that each week (whether synchronous or non-synchronous tasks were being experienced) the values fluctuated. It is therefore suggested that the quantitative data above is only a numeric product of the statements participants made after experiencing specific tasks. Accepting this weakness in the quantitative data for declarative competencies, such numeric data therefore has little meaning without reference to the qualitative data, in this case, the task reflections on the BBS.

VIEWPOINTS is considered learning about alternative theories or points of view on the same subject. All students had never experienced working in a synchronous environment in a education setting prior to the Case Study. The only synchronously networking undertaken by the young pre-service teachers was the informal use of CHAT using the MSN Messenger[39] application to connect with online buddies. Moreover, as was illustrated in Chapter 2 – Literature Review, very little research and pragmatic articles for teachers are currently available (as of 2004). Due to the initial apprehension about the benefits of synchronous networking in the first half of the 12-week course (during which two synchronous tasks were implemented as part of the Case Study) none of the students opted to undertake a course assignment that would involve the development of a lesson outline which would include a synchronous technology task. It may therefore be interpreted that not enough opportunities and resources were available for students to learn about alternative theories (such as the demerits of a constructivist enabled ICT pedagogy) beyond the scepticism introduced in Section 2.8 - The concerns about incorporating ICT in education, or alternative points of view except those garnered from colleagues who have led a similar journey through tertiary education. LI CHING (see below) however was quite expressive when she suggested that the familiarity of synchronous networking and iterative task design bred confidence in her adoption of ICT. Her view, of course, is positive and her beliefs (discussed as a category of epistemic competency above) altered from a rigid teaching style to one that is more student oriented. LIN LI provides a new idea of inter-school collaboration which also represents her point of view based upon her experiences interacting with other students throughout the 12-week course.

[39] MSN Messenger is an application by Microsoft. It can be viewed at http://www.microsoft.com/msn

Cognitive Outcome	When occurred	Participant's reflection
VIEWPOINTS	Post Tasks 3 & 4	I feel that this course has **'enlightened' me** on the methods of teaching that I was accustomed to previously. **Teaching style** has become less **rigid** and **learning for students** is very much **self-directed**. LI CHING
VIEWPOINTS	Post Tasks 3 & 4	**it is easy to allow co-operation between schools** like having an online essay writing competition that is on for a long duration to allow **inter-school co-operation**. LIN LI

The reflections of those participants being critical were indicative of the openness of the instructor who encouraged and contributed to discussion, risk-taking, being critical, and questioning provided information and exposure to new experiences. Through such encouragement a more experiential, student oriented interpretation of informed use of ICT integration could be developed and critiqued. As stated in Section 2.6 – The challenge of ICT integration, there is no common formula for effective integration of technology and none are offered by education policy makers, educationalists nor by the 12-week course 'Computer Applications in Language and Literature'. However, this Case Study, due to the interpretation of the triangulation of data, has proposed a framework for ICT integration which will be discussed later.

LI CHING (see below), early in the Case Study after experiencing Task 1, explicitly questions the need for technology to communicate synchronously when a straightforward face-to-face talk would achieve the objective of negotiation but with the added benefit of increasing social skills. In effect, she is stating that ICT appears to be a solution to an undefined problem. Such critique is becoming commonplace in the literature as universities invest millions of dollars in technology upgrading without a clear plan of its educational worth (Cuban, 2002).

HUI MIN is also critical of being forced by external factors to use technology during her practicum and then, on this course, forced herself to integrate technology in a lesson outline simply to meet a requirement of using ICT[40]. Initial reaction to the use of

[40] Participants commented that they had to use technology for 30% of their lessons during their practicum. How the 30% was quantified and the quality of integration were never made clear to the pre-service teachers. Most probably, it was an interpretation of a component of MP1 that envisaged that by 2002 students would spend up to 30% of curriculum time using ICT (Lim, 2004). Pre-service teachers stated throughout the course that they had used technology to present information (such as via PowerPoint) in a didactic manner, and this was considered sufficient to meet the school's 30% requirement of technology usage.

synchronous networking considered both the technical issues as well as the communication concerns.

Cognitive Outcome	When occurred	Participant's reflection
CRITICAL	Post Task 1	having a chat window is said to provide students with the freedom to negotiate with other groups, but **wouldn't negotiation in a face-to-face manner allows even greater freedom for communication and the development for social skills**? Are we sometimes guilty of trying to convince ourselves that every software is useful? LI CHING
CRITICAL	Post Task 2	I am not against the use of IT. it's just that **i feel that it can be pretty much over-rated**. Just like how during practicum, we are **pressured** into **'enhancing** 'our lessons with IT to **"score" better grades**. The problem with my group was that we felt so **compelled to infuse IT**. It was as though we were **trying to squeeze** it into our lesson plan when we all felt that we would rather have **done without it if given the choice**. HUI MIN

Over time, and certainly after the final synchronous networking task in this Case Study research, trainees remained critical but also positive. The realisation that clear objectives, achievable outcomes, clarity of communication, and the perseverance to succeed being essential ingredients of task design was highlighted by HUI MIN (see below). The comments illustrate that students were prepared to make a statement by critiquing their experiences and offering solutions for consideration.

Cognitive Outcome	When occurred	Participant's reflection
CRITICAL	Post Tasks 3 & 4	When we first started using istorm, **i did not like the idea** of it as i felt that it encouraged certain groups to hog the main window. When that happened, not all the groups would have an equal chance to share their views with the rest of the class. **However**, as seen in the last two weeks, **a little modification** by getting groups to take turns has **provided excellent results**. Groups are more focused in the information that that they put up and they take more time in looking at the postings done by others. Therefore, i guess **the onus is on the teacher to ensure that student activities work** and when they do not, the teacher will have to take it upon himself/herself to **make the necessary adjustments**. KWOK HUI MIN

Next, understanding is a more difficult category to acknowledge. Understanding may be considered comprehension through experience. Searching the BBS reflections for an interpretation of facts beyond representation of points of view, or being critical, can be problematic as the language exponents and the reflection's wider context need to be taken into account. Many of the BBS reflections could be tagged to the aforementioned categories within the academic competencies by considering the language and associated context of the posting. preciaLILY's reflection below, for example, was initially tagged as a change in teaching beliefs (a VALUES category in epistemic competency) but could also be interpreted as representing understanding. She explains how her pedagogy has changed throughout the 12-week course and Case Study tasks. She suggests benefits of increased collaboration and interaction, the role of the student as a cooperative member of a learning community, and how an associated pedagogy can facilitate inter-school communication. She states at the end of her posting that she is now more aware of the possibilities of ICT. preciaLILY's reflection is a short story that can be interpreted as an understanding of informed ICT usage. Unfortunately, opportunities were not provided for more lengthy interpretations, presentations and re-evaluation of acquired knowledge. This may be due to the constraints of a course syllabus and the class duration in which this Case Study was conducted. It is therefore recommended that future research on ICT integration that sets out to analyse related academic competencies allow participants to develop and tell their 'story' of informed ICT in order to gain a better appreciation of their understanding.

Cognitive Outcome	When occurred	Participant's reflection
UNDERSTAND	Post Tasks 3 & 4	Undeniably, throughout this course, my **opinions** about teaching and learning as well as student activities **have changed**. Teaching students using IT is now embraced as I have **discovered** many benefits that are linked to it. Student activities no longer have to be done individually as I **realised** the importance and significance of student activities being collaborative and interactive. For instance, using istorm is an innovative way of enhancing interaction and collaboration amongst the students, even across different institutions. Previously, I do not think that this is possible in reality but **now i have come to know that it can be done.** =) preciaLILY

6.3 Developing competencies

Chapter 4 - Case Study Process and Findings: Qualitative Data, detailed the process of the iteratively developed tasks. In Task 1 it was apparent that trainees were indeed sceptical of synchronous networking and its benefits as a tool to facilitate learning and were very much focussed upon the technology's intricacies even though a trial of the networking software had been previously undertaken. As such, the initial focus was a development of generic competencies of new ideas and core skills. However, in Task 2, which was designed by the instructor after observing the participants working on Task 1 and the follow-up interviews, an impact upon the epistemic and declarative competencies began to emerge. The qualitative data displayed evidence of declarative competencies (questioning and making decisions) and epistemic competencies (planning), as explained below.

> "I guess as teachers, regardless of what subjects we are teaching, we really do need to be more risk taking and trust pupils to do what they can do and not what we 'think' they can do." LI CHING

Such admission was a departure from the criticism and scepticism displayed during and after Task 1. This illustrates that in using computer mediated communication (in this case, facilitated by synchronous technology) it is important to shift quickly from developing or supporting generic competencies, and progress to epistemic and declarative competencies to facilitate learning (as evidenced by Section 5.5 - Breadth of Learning) and changing teachers' beliefs (as developed in Section 6.2 – Reflections on Teaching and Learning). LI CHING's comments also suggest that participants had reflected upon Task 2 and discovered an alternative viewpoint to ICT integration and associated learning. Recall that the participants (pre-service teacher trainees) were in their final year of undergraduate study and through the experiences with synchronous networking technology and also the participation in the Computer Applications in Language and Literature course providing the context for this Case Study, had been taken out of their comfort zone of teaching strategies that focussed much more on a didactic process and closed outcomes. This was also supported by the quantitative data collated after Task 2 (see Figure 6.1 – Task 2). After Task 3 one participant commented,

> "Doing that simple activity in class has given me a totally new perspective on how to approach an English lesson for Young Learners." HISHAM

The participant was not prompted to comment about teaching beliefs. In fact he was initially commenting upon the variety of language within a short text. But he quickly emphasised how such a task (in this case, Task 3) using synchronous technology impacted upon his beliefs as a teacher. Making connections to his teaching situation at school and re-aligning his own values display an increase in epistemic competencies. This can be confirmed with all the participants by illustrating the quantitative data (see Figure 6.2 – Task 3). With reference to Figures 6.1 and 6.2, Tasks 2 and 3, respectively, it is shown that epistemic competencies (VALUES(40% to 77%) and CONNECTIONS (47% to 69%)) increased. Similarly, declarative competencies (UNDERSTAND (60% to 85%), VIEWPOINTS (60% to 77%) and CRITICAL (53% to 69%)) increased thereby illustrating that participants were displaying transformative potential (Goodyear, 2000) as they reflected upon teaching, learning, communication and task design through informed use.

Such awareness of teaching beliefs and, it is suggested, increased breadth of learning facilitated by tasks that involve synchronous networking technology lead to a development of competencies that impact upon informed use of ICT in educational contexts. The initial focus may indeed be on generic competencies but it is essential that teachers and learners progress to design tasks that promote epistemic and declarative competencies. For instance, by Task 4 the participants began to discover the issues that lead to good learning: flexibility in procedure, content and outcome within a non-judgemental environment that supports different modes of communication and representation, as illustrated in the proposed framework for synchronous technologies and good learning, developed as a result of this Case Study research.

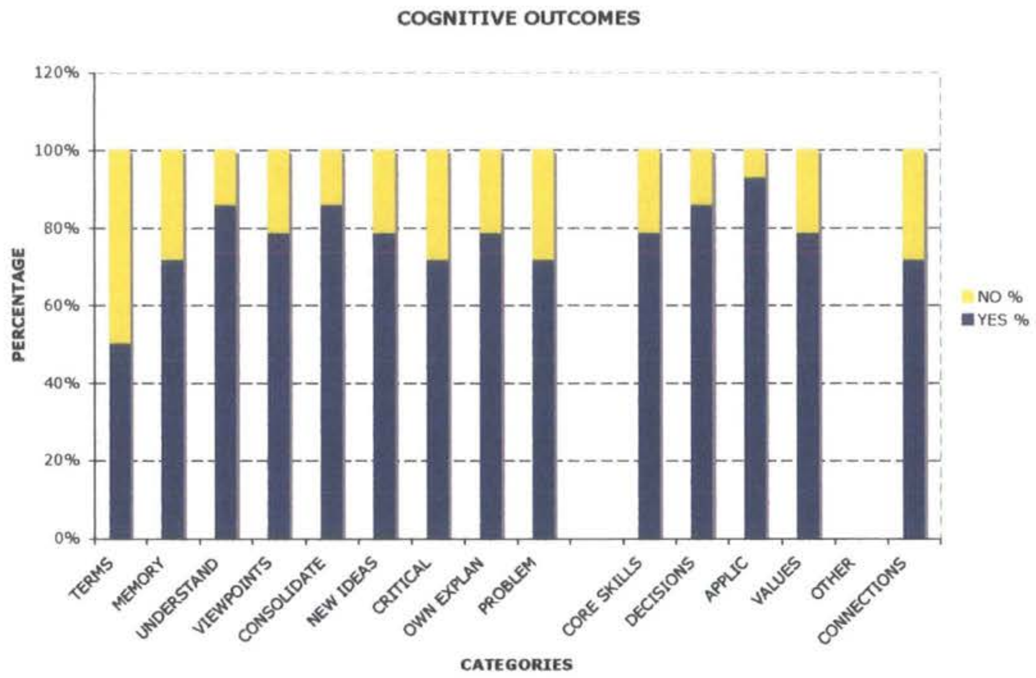


Figure 6-1 Task 2 (week 6)

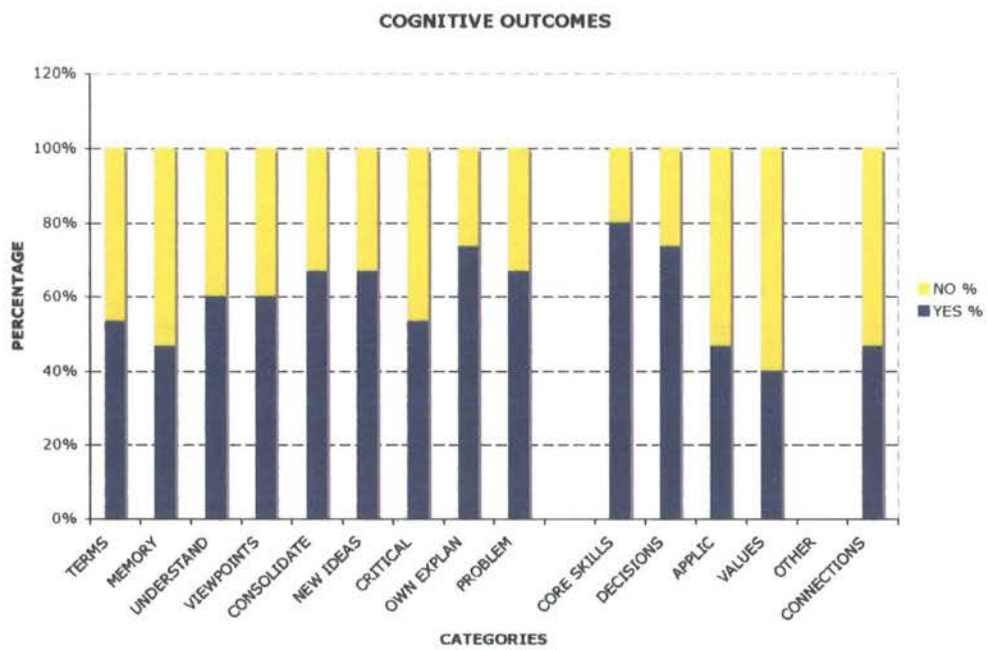


Figure 6-2 Task 3 (week 9)

6.4 Summary

First, it must be stated that the above discussion suggests that academic competencies were indeed developed throughout the Case Study research period, and had an impact on the development of the synchronous networked tasks. However, it is acknowledged that to what degree such competencies were increased was not precisely measured as this was considered beyond the scope of this Case Study. It is therefore recommended that future research in synchronous networking attempt to quantify an increase in the academic competencies, and may be further facilitated by using the quantitative instrument utilised in this Case Study.

Secondly, from the discussion above it can be seen that there is a process of development in the communication and changing beliefs of the teacher trainees using ICT in an informed way. This theme was the main focus of this research though it is acknowledged that increasing competencies impacted upon their task design and implementation which, in turn, impacted upon their pedagogical considerations (see Appendix 14 for an illustrative representation of competencies impacting upon the tasks throughout the Case Study research period). The trainees began to construct and internalise what they were doing and consider why they were doing certain activities in undertaking a synchronous network-based task. This may be considered an initial stage in a process of participants changing their pedagogical beliefs.

Subsequent stages of participants' development in pedagogical belief is the sharing of their points of view (or, it may be boldly suggested, understanding) with fellow trainees. In other words, the trainees were expressing what they had internalised through discussion and critique of the shared information. And through such discussions (during the task process, on the BBS, or during the interviews) the trainees refined their understandings. This process is illustrated in Figure 6.1 - Stages of the process in the changing of beliefs.

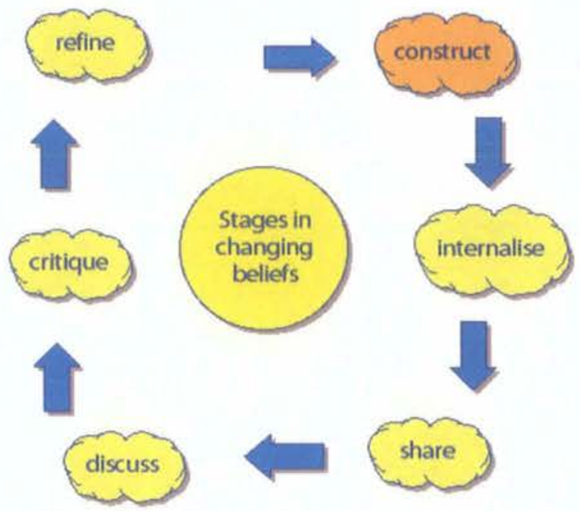


Figure 6-3 Stages of the process in the changing of beliefs

To support these proposed stages, Goodyear (2001) suggests that, "Seeing learning as a process of guided construction of knowledge means that we have to pay close attention to the learner's activity- cognitive or otherwise" (p.65). In effect, this means that without appropriate activities within tasks designed for synchronous networking, there may be little useful learning. For instance, the evidence in this research shows that there is a low correlation between ACTIVITIES and COGNITIVE OUTCOMES for both SYNCH and NON-SYNCH tasks. Nevertheless, the learning does appear to be influenced by interaction with fellow trainees, leading to increased academic competencies (generic, epistemic and declarative) as illustrated in the staged cycle in Figure 6.1 - Stages of the process in the changing of beliefs, and supported in the literature by Goodyear (2001). The SYNCH networking tasks may consequently provide affordances to the learning taking place. In other words, although the quantitative evidence linking ACTIVITIES and COGNITIVE OUTCOMES is weak (see Chapter 5 – Case Study Process and Findings: Quantitative Data), there is evidence through the qualitative data that trainees' beliefs were changing as a result of their experiences over the 12-week course utilising synchronous networking technologies.

The qualitative evidence also reveals that using synchronous networking technologies becomes a statement of an approach to pedagogy. At the outset many of the trainees viewed their desirable teaching as a transmission of content. As this Case Study developed, the trainees were actively involved and participated in, as well as reflected upon, designing good learning tasks in a synchronous networking environment. The resultant learning therefore shifted from content to activities. To implement synchronous networking tasks successfully, the pre-service teachers had to become good task designers and focus on the activities and anticipated cognitive outcomes that may lead to good learning. A return to the literature at this point revealed that Goodyear (2001) in the paper, 'Psychological Foundations for Networked Learning' where synchronous and asynchronous networking is discussed in general terms (from online database access to online chatting), hypothesised that content in these ICT-rich environments becomes the context or resource, and the learning is what the students do with the content. This thesis has, to some degree, supported Goodyear's hypothesis as the discussion of the data above surmises that the learning shifted from content to activities, that is, to what students actually did with the tasks' content.

In conclusion, this thesis has shed light on an area in educational technology that is most often dominated by instructional technologists than constructivist academics, that is, synchronous networking technology. It has provided an unanticipated though welcome opportunity, due to the reflections and interpretations of the qualitative and quantitative data, to propose a framework that can facilitate good learning in the educational technology domain.

6.5 Proposed framework for synchronous networking technologies and good learning

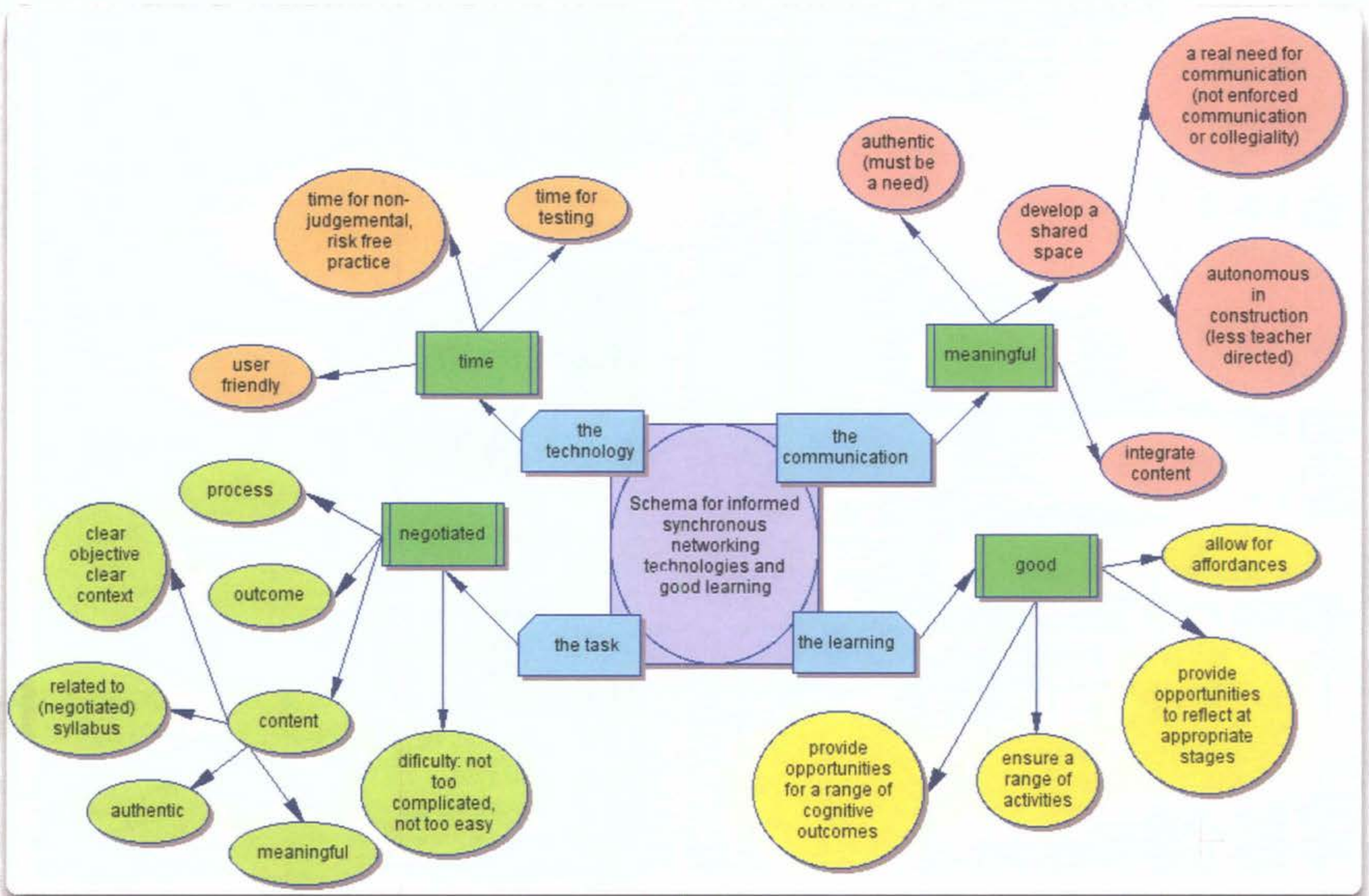
To effect a change in beliefs of teachers and to promote a constructivist approach to teaching and ownership of leaning, this research thesis thus proposes a framework for synchronous networking technologies and associated good learning. This framework is detailed below and then presented in Figure 6.2 - Framework for synchronous networking technologies and good learning, as a result of the process and outcomes of this thesis. A summary of its key points are derived from the analysis and interpretation of the triangulation of data in Chapter 4 – Case Study Process and Findings: Qualitative Data, Chapter 5 – Case Study Process and Findings: Quantitative Data, and Section 6.2 – Reflections on teaching and learning. These are:

1. **Test** and ensure the technology (hardware, software and the network) is functioning prior to undertaking the task.
    a. The task focus must be on good learning and not the technology.
2. Provide **time** for a basic risk free, non-judgemental task that allows users to become familiarised with the synchronous networking technologies.
3. Allow users to practice **communication skills** (formal on the main frame and informal in the CHAT frame), and also turn-taking on both document access and video-conference interactions.
4. Provide learners with a **learning objective** and a **context** (the CONTENT). The process of achieving the outcome must be negotiated by the learners.
    a. However, Goodyear (2001) cautions that the objective should not be so specific as to limit input and negotiation, and not so open as to simply facilitate a lot of talk by little learning.
5. **Integrate** content such as English communication skills, digital literacy (Vallance, 2005), and science.
6. Provide opportunities for learners to be aware of the **ACTIVITIES** they are doing in undertaking a synchronous networking technologies based task.
7. Encourage learners to **reflect** on their learning by posting questions that will draw out what they know of the content upon completion of the task, or a stage of the task (COGNITIVE OUTCOMES).
8. Provide a necessary need for learners to create a **shared space**.
    a. Without such sharing then completion of the task should not be possible. This thus supports collaboration as learners would need everyone's input to develop an output where the whole is greater than the sum of its parts.
    b. Goodyear (2001) states that, "Successful online/ networking learning communities emerge and shape themselves" (p.69). As such, the instructor can help influence the interactions but does not necessarily create the community. Therefore, instructors need to step back and allow learners

themselves to develop the task process and associated activities, even if these activities were unanticipated or varies greatly from that predicted by the task designer or instructor.

9. The instructor should set **boundaries** such as a time frame, use of certain language online[41], and evaluation criteria.
10. Allow for **affordances**.
    a. Let individuals bring and use specific skills that can add to the communication or task process.

[41] This is often termed netiquette (see Webopedia at http://www.webopedia.com)



Proposed framework for synchronous networking technologies and good learning

Figure 6-4 Proposed framework for synchronous networking technologies and good learning

6.5.1 Interpretation of the framework

Learning is viewed as a process of guided construction (Goodyear, 2000). As such it is necessary to design meaningful tasks that encourage appropriate activities that will promote a range of cognitive outcomes in the pursuit of a challenging yet manageable product. For example, in an English language learning lesson there is a language objective, and a task needs to ensure that opportunities are provided for the target language to be used. Chapelle (2003) calls this 'utility'. In effect, the task must have a clear purpose so that learning can occur. In synchronous networking the task must not succumb to social discourse (as is often mentioned in the limited literature and occurred in Task 1 of this Case Study research) but considered for generic, epistemic and declarative competencies. Activities within each of these three competency categories may not, as mentioned in Chapter 4 – Case Study Process and Findings: Qualitative Data, be predictable. Although an instructor may provide opportunities for interaction using the target language, the synchronous discourse may indeed be otherwise. To accept and appreciate such open-endedness in task process and outcome can result in a wider breadth of learning as was shown in Chapter 5 – Case Study Process and Findings: Quantitative Data. Good learning should thus ensure opportunities for a range of activities and cognitive outcomes (considering these terms as defined in this research), and provide opportunities to reflect at appropriate stages. Un-prescribed affordances should also not be neglected but embraced as an unforeseen but welcome addition to the learning context.

The communication within a synchronous networking environment needs to be meaningful. The development of the shared space led to an authentic need to communicate for specific purposes. This is in stark contrast to enforced collegiality where students and/or instructors participate in discussion simply to meet course or administrative requirements (Salmon, 2002). The shared space was achieved both asynchronously (the BBS) and synchronously (the CHAT) throughout the Case Study. The task also has to be meaningful, as mentioned above, and offer authenticity in order to have face validity with the participants. This research has found that a negotiated task in terms of content, process and outcome is favourable in promoting a wider breadth of learning. However, certain conditions were considered needed to be imposed on the content. These were that the content needed to be related to a prescribed course syllabus (such as a school subject syllabus or, as in this Case Study, a university module syllabus) or a negotiated syllabus (such as course developed after a placement test and/or needs analysis). Recall that it is what the learners do with the content (i.e. the activities) that promote good learning (see Section 6.4 - Summary).

The four tasks developed in the iterative manner in this Case Study also revealed the need for a manageable objective within a clear context. Although the use of the technology was initially considered the focus of learning (for example, how to access the grab/snatch button), it soon became less prominent in the discourse between the synchronously connected students and those working in groups around one computer terminal. This was achieved by providing time to participate in a risk free, non-judgemental task to practice communication and synchronous CHAT, and also type in the main document window. Needless to say, to maintain the technology's face validity the network had to be tried and tested (simply connect and disconnect) prior to usage so that the participants' focus was on good learning and not the technology.

This framework therefore has been developed as a result of discussing the changing beliefs of pre-service teachers using synchronous ICT. In effect, this framework is a product of the discourse on activities and cognitive outcomes between the participants themselves on the BBS, during the synchronous tasks in groups, during the synchronous tasks in groups around the terminals, and in interviews with the researcher.

6.5.2 The contribution of the framework to the literature on synchronous internetworking

The literature was helpful in collating the key factors considered necessary for informed ICT integration. These key factors were summated into four distinct characteristics: activities, integration, collaboration, shared spaces (see Section 2.9 - Summary). This was useful in designing and implementing tasks that facilitated activities and cognitive outcomes. However, the development of the proposed framework for synchronous networking and good learning was a result of applying the aforementioned characteristics and associated key factors (see Sections 2.9 – Summary, and 2.10 - The Research Question) at the classroom level. However, it does not take into account change in teaching beliefs as teachers use synchronous inter-networked technology over a period of time within an ICT course that blends synch and non synch technology through informed task design and pedagogy. A new framework was thus proposed as being helpful in understanding how and why synchronous inter-networked technology can facilitate a change in pre-service teachers' beliefs of ICT adoption and associated good learning (see Figure 6.2 - Proposed framework for synchronous networking technologies and good learning). Learning, task, communication, and technology were considered key elements for successful synchronous inter-networked technology.

In this chapter, the achievements of the Case Study research have been discussed by revisiting the research question. The research question relating to synchronous inter-networked technology and teacher adoption of ICT was identified from the theoretical and practical issues presented in the literature review. To recall, the research is to study the impact of synchronous internetworked technology on the changing beliefs in ICT integration by pre-service teachers. Based on the researcher's findings, it is suggested that design and implementation of synchronous inter-networked technology tasks impacted upon the beliefs of the pre-service teachers' adoption of ICT, and that four key factors of informed synchronous inter-networked adoption were consequently proposed: the learning, the task, the communication, the technology. An illustrative framework encompassing the components of these four key factors was drawn (see Figure 6.2 - Proposed framework for synchronous networking technologies and good learning). The framework helped to demonstrate that informed synchronous networking is influenced by a multi-faceted variety of factors. However, given that synchronous inter-networked technology alone does not facilitate a change in teachers' beliefs in ICT adoption, it needs to be considered in further research whether more could have been achieved if an analysis of the asynchronous networking tasks that blended into the Case Study could have resulted in more concrete conclusions.

Chapter 7 CONCLUSION

7.1 Summary of the Case Study

This research aimed to provide new perspectives and experiences in technology-based teaching and learning in an attempt to produce new knowledge that can further inform the literature on technology in education. In order to provide a context and need for this research it was shown that nations, particularly rich countries whose economic success and continued power lie in investing heavily in technology, sought to integrate technology in education to further human capital (Woodhall, 1997) or technological capital (Goh, 1998; Towndrow & Vallance, 2004). However, it was found that such policies were abundant in desired outcomes but lacked specifics when it came to the application of ICT by teachers to support learning (Deng & Gopinathan, 1999; Cuban, 2002). Through a review of the literature, it was additionally discovered that integration of technology in teaching practices is inconclusive in its benefits for better learning (Baker *et al.*, 1993; Becker & Ravitz, 2001; Cuban, 2002; Parr, 2003). A number of technology focussed research projects were reported and one in particular was considered in depth primarily due to it being a 12-year longitudinal study, entitled Apple Classrooms of Tomorrow (ACOT). The ACOT study reports were periodically published online; one of the first such research projects to seek global coverage through utilisation of the World Wide Web since 1994[42]. The ACOT researchers indeed concluded that technology integration by teachers and learners over the extensive period impacted upon pedagogical practices and the students' learning (Sandholtz *et al.*, 1997). However, when measuring the ACOT students' success in standardised tests, they did not score significantly better than those students who were not on the ACOT programme in the same schools (Baker *et al.*, 1993). The benefits were considered the affordances that technology facilitated, such as being capable communicators, independent discoverers, group oriented and, as

[42] In 1994 the researcher was participating in a Masters in Computer Assisted Language Learning under the guidance of John Higgins at Stirling University, UK. The ACOT project reports were, at that time, periodically published online for academics, policy makers and critics to read and comment. In addition, Singapore's Ministry of Education sent representatives to visit the ACOT project and through personal communication it has been suggested that MP1 was informed by the ACOT study.

expected, have increased technical skills (Baker *et al.*, 1993; Tierney *et al.*, 2005). Even a cursory glance at other reviews that considered Effect Size of research in the 1990's portrayed a varied picture of some gains in quantitative tests by students in experimental groups (Kulik, 1994;Wood *et al.*, 1999; Parr, 2003). As the literature for the late 1990's and early years of the 21st century revealed, technology usage in education became more exploratory as technical innovation proliferated and Internet access became more accessible such as Web-based Learning Management Systems (Gibbs, 1999) and online video-conferencing (Freeman, 1998). However, it was also surmised that the delivery of information and the types of learning had not correspondingly evolved into innovative practices, despite the observations and recommendations of the ACOT researchers in the previous decade (Knipe & Lee, 2002). It was therefore concluded that innovative technologies were not necessarily being utilised in informed ways to enhance a social constructivist pedagogy (Jonassen *et al.*, 1999) that may best be supported by technology integration.

In order to address this concern and apparent lack of reporting in the literature, it was decided to utilise a technology that facilitated real time document development and communication to support new teachers in their training for good ICT adoption. This decision was influenced by the uniqueness of the technology, its anticipated future utilisation in the world of work, and, more importantly, provide all participants with a new experience upon which to consider a more informed integration of ICT in their teaching and their pupils' learning. To implement such a strategy a number of key components that may facilitate better integration by teachers and possibly better learning by students were tabulated and categorised. These were further summarised into four categories of Activities, Integration, Communication and Shared Space. This concurred with Selwyn's (1997) framework for ICT adoption (see Section 2.7 – Characteristics of informed ICT integration). To best facilitate an associated attempt for learning, Goodyear's (2000) good learning was considered as a means of guiding the participants to construct meaning through critical reflection.

In order to discover the impact of the synchronous networking technology by pre-service teachers, a Case Study approach was considered most appropriate in order to gain a rich, thick description of the data (Merriam, 1988). The Case Study was conducted in four specific procedural phases: Phase 1: Planning action and research; Phase 2: Taking action- monitoring, reflecting, documenting; Phase 3: (Re)constructing, evaluating; Phase 4: Theorising, disseminating (Levy, 2003). Moreover, as the participants took part in a 12-week BEd course with the researcher, this presented an opportunity for a number of instances of synchronous networking to be implemented. The participants were thus provided authentic opportunities to apply the theory and practice from the course to their design and implementation of four synchronous tasks.

To challenge and stimulate the participants in their weekly reflections and, more importantly, to gather data on possible pre-service teacher development and changing beliefs, data was collected in three ways; a triangulation of data (Guba & Lincoln, 1981). A weekly quantitative survey collated data on activities and cognitive outcomes. This allowed for a comparison between the synchronous tasks and non-synchronous tasks. In addition, the same survey completed by the instructor highlighted any discrepancies about what the teacher implemented and that noticed by the students. Secondly, each synchronous networking task was digitally captured on the computer screen and simultaneous group discussion were recorded in digital video format. By transcribing the recordings and viewing the simultaneous actions the researcher had a clearer idea of the process of the task implementation. This, it is suggested, is a unique method of data collection due to the innovative technology utilised. Without this component of capturing the task process, a researcher may only rely upon that recalled by the subjects or that observed by the researcher (or a research assistant). The third component in this triangulation of data collection were the post task instances and follow up Bulletin Board System (BBS) postings. The post task interviews requested participants to recall the task process and outcome, suggest improvement in task design or the technology usage for the subsequent task, consider how the design and use of synchronous networking tasks are impacting upon their use of technology, and how they connect the experiences to that of their schools. The Bulletin Board System (BBS) provided an opportunity for participants to take time and consider the experience before writing their comments. The participants reflected on their experiences and considered improvements to each task design, process and outcome. As the participants were a purposive selected group of competent users of technology, it was anticipated that the focus would mostly be on the pedagogy and learning and less on the technical issues (which indeed proved to be the case after week 3, Task 1). The comments became more vivid to the researcher as he could see what the participants were referring to by viewing again the captured task process and group discussion. It is believed that this unique method of data collection can be further implemented in technology based research. More importantly though is that the triangulation of data collection, collation and interpretation within the context of a Case Study research approach attempted to overcome the difficult issues of credibility, dependability, transferability, and confirmability (as discussed in Section 3.3 - Limitations).

The contributions by the pre-service teacher trainees within the process of the iterative task development, post task discussions, and the on-going commentaries on the BBS, provided insights to the research question regarding changing beliefs and the impact of the role of synchronous networking in affecting such change. Initially, the tasks highlighted a need for better technological skills and user-interface considerations above the more complicated, yet more important issues of a desired constructivist pedagogy and good learning. This was referred to as an increase in the trainees' generic competencies. Through the trainees' reflections of the procedure, process and outcomes, and discussion of the associated problems and suggested solutions, the ensuing tasks allowed trainees to become more immersed in the learning objectives that the technology attempted to facilitate. This resulted in, and was referred to as, an increase in epistemic and declarative competencies. A shared space, or community of practice, evolved as trainees worked through the tasks, and commented upon the reflections of others. Following Tasks 3 and 4 there was much evidence of change in teaching beliefs in trainees' commentaries. For instance, some trainees were explicit in the awareness of change. However, it is also acknowledged that some trainees were cautious and, although positive and optimistic, stated that they needed more experience of ICT integration (especially with a class size of 40 pupils). Others were also concerned about the dichotomy of teaching to the test while simultaneously expected to help learners learn.

Upon completion of the Case Study research data collection and corresponding 12-week BEd course, the data was revisited in particular to see if components in the quantitative data (i.e. the surveys) matched exponents in the qualitative data (i.e. the digitally captured discussions, the interviews and the BBS postings). Chapter 6 – Discussion of the Case Study findings, discusses this in detail with the result that generic, epistemic and declarative competencies were considered to have been developed by the participants during the 12-week period (see Section 6.3 – Developing competencies), as mentioned above. As these competencies became apparent so too did the comments on a change in the participants' beliefs about informed use of ICT. In summary, they commented that past experiences and taught modules tended to support a didactic approach with the focus on teacher delivering information. Throughout the Case Study, the participants commented upon the benefits of a more learner-oriented strategy and considered a social constructivist approach beneficial if technology is to be used in an informed way and not to simply mimic strategies achievable without technology.

The development of the three aforementioned competencies and the comments that supported these also revealed commonalities in the development of synchronous networking tasks. These were communication, learning, time and technology. A framework was thus designed that may be considered a product of the findings of this Case Study (see Section 6.5 – Proposed framework for synchronous networking technologies and good learning). However, the framework would need to be applied to additional research contexts to further test for reliability. This proposed framework, though, is considered a development of Selwyn's framework and adds to the literature on informed ICT integration.

In summary, the research has highlighted a development of competencies considered appropriate for informed ICT integration; namely, generic, epistemic and declarative. In addition, a framework was developed that can be considered in the design of synchronous network environments to support good learning. It is anticipated that the competencies and the framework contribute new knowledge to the literature on technology in education on how best facilitate the informed integration of ICT by teachers. The research can thus be utilised to provide guidance to educationalists on how best implement informed technology-supported practices previously considered lacking in a nation's education policy that aims to develop technological capital.

7.2 Future research

Could more have been done? Given the complexity of the issues being studied in this innovative Case Study, it is necessary for the findings to be validated through replication. However, a number of changes in the design of the Case Study research are proposed, below, that could enhance the participants' experiences and also the richness of the data collected. Avenues for potential research in order to place the findings of this Case Study in the wider context of technological innovation and the challenge to change educational settings in the Digital Age are thus suggested.

7.2.1 Multimodality in task design

A number of criteria were considered in the task design (Candlin, 1987; Towndrow & Vallance, 2004). During the iterative tasks the participants not only utilised text but also images. Given this surprising but welcome addition the factor of multimodality was not however considered. This may be deemed a weakness in the task designs, particularly if the research by Kress (2003) and The New London Group (1996) are taken into account. For instance, The New London Group identify six (6) areas in which functional grammars, or meta-languages, describe and explain meaning that needs to be taken into account in task design: linguistic design, visual design, audio design, gestural design, spatial design, and multimodal design. In any task design there is an interplay between the content such as text and images, between the learner and the task, and between the instructions and the activities. The combination of images and written text, for example, present interrelated modes of representing meaning as the 'texts' cannot be read linearly and thus influence the process of a given task. In this Case Study context this would influence the activities and cognitive outcomes. It is thus important to consider the literature that recognises multimodality as central to task design, process, implementation and outcome, particularly using digital technologies such as synchronous inter-networking.

7.2.2 Subject focus

The proposed framework that resulted due to the Case Study research may be considered multi-disciplinary. In other words, the proposed framework for informed use of synchronous ICT can be applied to subjects such as English, Science and Maths. This research has shown through its tasks and associated lesson plans how English language may be contextualised. In Science, students at remote locations may have specific information that when collated can help solve a problem. For example, a picture of a rusted but broken pipe may be observed in iStorm. This picture may be of an object that was the cause of an accident and the students need to provide possible scenarios and reasons why the object failed. Questions may include, How did the object (say, a pipe) break? What grade material is it? Is the material brittle or fragile? What may have been the lab test results? What is the extent of the rust? Has one group physically got the object? What are its dimensions? What forces was it subjected to? What was it used for? The synchronous discussion (CHAT) and the collaborative development of a report on findings can be undertaken. Mathematics can be similarly facilitated via the synchronous chalkboard tool in iStorm. For example, students at remote locations may collaboratively develop a solution to problem posed on the Internet or by a teacher. The key to the beneficial process and outcome, whether English, Maths or Science is the consideration of the learning, the task, the communication and the technology. In other words, the application of the proposed framework for informed ICT integration.

7.2.3 Surveys with named participants

The quantitative data revealed a low correlation between SYNCH COGNITIVE OUTCOMES and SYNCH ACTIVITIES (0.059). To obtain a truer correlation between ACTIVITIES and COGNITIVE OUTCOMES each trainee would have had to insert their name on the surveys so that the data could be collated for each participant, then correlated using the variables of ACTIVITIES and COGNITIVE OUTCOMES. Further research in synchronous networking task design is suggested as it may be pre-supposed that certain activities 'may' promote certain cognitive outcomes.

7.3 Future world of work

During the pre-research and Case Study research period, synchronous inter-networked technologies have progressed; as one would, and should, anticipate in this Digital Age[43]. Conducting a further investigation into the technology, a major project named FaceTop, developed by the University of North Carolina at Chapel Hill, overcomes many of the technical issues raised in this research and provides a more conducive environment for naturalistic, authentic communication by distance. We have seen how students collaborate across distance on a shared document, text chatting and also video-conferencing simultaneously in real-time. The future of synchronous networking though is far more sophisticated technologically and much more conducive to communication. Transparent video desktops such as FaceTop, for instance, allow for users to see each other 'within' their own semi-transparent desktops on the computer monitors (Stotts, Smith & Gyllstrom, 2003). Referring to Figures 7.1 - FaceTop and a Web Browser, and FaceTop and a collaborative document, users can touch items on the desktop and move them around. At the same time another user can watch the actions from their remote computer terminal and respond by touching that same item and further moving it to another location. Users can see each other and talk as if watching each other through a thin piece of glass. Research at Chapel Hill is even developing walls in rooms that include this technology for users at remote locations to appear to be in the same room.

In May 2005, Microsoft revealed its vision of the future workspace. In its White Paper entitled 'Digital Workstyle: The New World of Work' (2005) collaboration was considered a key capability of its future technology and end-users;

> "Instant messaging, telephony and conference will converge in an environment that gives information workers easy and flexible access to all of their communication tools, with a secure infrastructure that archives the entire collaborative process in one place. Collaborative workspaces will be simple to set up and use with co-workers,

[43] Collaborative documents can also be developed via a Web browser. For an example, see Writely – The Web Word Processor, at http://www.writely.com/ was released in 2005 and purchased by Google.

partners and customers to create documents, work on projects and find and use relevant business information."

It is suggested that the collaborative product such as a document would have a 'presence' due to the collaborative process where a number of users work on the document synchronously.

This Case Study research has demonstrated though that synchronous networking and document collaboration are currently available (and affordable). The evidence produced by this Case Study agrees with Microsoft's vision that collaboration is going to be an important skill required of so-called knowledge workers in the Digital Age. However, the 'Net-geners' require guidance as they develop their competencies in using synchronous technology, implementing synchronous collaboration, and communicating in a shared space. The proposed framework for informed ICT integration in this Case Study thus represents a milestone in the research that aims to support the future of work and education.

Figure 7-1 FaceTop and a Web Browser, and FaceTop and a collaborative document

7.4 Closing remarks

This Case Study provided insights for the utilisation of synchronous networking through its discussion of learning outcomes and the activities that support the changes in pedagogical beliefs of pre-service teachers. It has to be stated though that this Case Study research did not fully reveal that synchronous inter-networked technologies alone change pre-service teachers' beliefs in ICT adoption. Promoters of ICT provide enough rhetoric for the need to change education systems yet none provide concrete proposals that are pedagogically focussed (Cuban, 2002) nor do they provide substantive details on how such change can be achieved (Towndrow & Vallance, 2004). ICT adoption is gaining recognition as a necessity in education systems worldwide but 'how' and 'why' ICT is adopted and utilised in an informed way remains unclear. It is anticipated that this Case Study research has added to the literature. Further research in applying the proposed framework across subject disciplines within schools is recommended in order to evaluate the learning that synchronous inter-networked technologies can promote. Teaching, learning and communication is going to have to fundamentally alter as synchronous inter-networked technologies impact upon the world of work and education. This Case Study research has demonstrated that ICT learning environments will radically change and, to reiterate, teachers and learners will need to be trained in preparation for a new way of communicating, learning and teaching in today's Digital Age.

References[44]

Baker, E.L., Gearhart, M. & Herman, J.L. (1993). Evaluating the Apple Classrooms of Tomorrow: the UCLA evaluation studies. Retrieved July 25, 2004, from *http:// www.cse.ucla.edu/CRESST/Reports/TECH353.pdf.*

Bangert-Drowns, R. L. (1993). The word processor as an instructional tool: a meta analysis of word processing in writing instruction. *Review of Educational Research,* **63**(1), pp. 69-93.

Becker, H. J. (1994). Mindless or mindful use of integrating learning systems. *International Journal of Educational Research,* **21**(1), pp. 65-79.

Becker, H. J., & Ravitz, J. L. (2001). Computer use by teachers: are Cuban's predictions correct? Paper presented at the *2001 Annual meeting of the American Educational Research Association, Seattle, Washington.* Retrieved February 28, 2002, from *http://www.crito.uci.edu/tlc/findings/conferences-pdf/aera_2001.pdf.*

BECTA (1998). *The UK ILS evaluations: final report.* UK: British Educational Communications and Technology Agency.

BECTA (2003). A review of the research literature on the use of MLES and VLES in education. Retrieved July 2, 2003, from *http://www.becta.org.uk/Research/Reports/vle.cfm.*

Born Digital (2002). Wired, 10.09.

[44] The reference section adheres to the APA format, 5th Edition. In particular, the electronic references contain the author and date of publication (where stated), the date of access, and the page address (its URL). However, it is anticipated a number of Websites may have been relocated since accessing. For example, during this research the Ministry of Education, Singapore decided to re-name its domain from 'moe.edu.sg' to 'moe.gov.sg'; a minor change but its impact has been enormous on the papers published prior to the renaming. This is one of the disadvantages of using online sources. To seek the required reference, it is suggested the reader types the author and / or title into a Search engine such as Google, or write to the Website administrator, or e-mail the researcher (mvallance@mac.com).

Brown, A. L. (1992). Design experiments: theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences,* **2**(2), pp. 141-178.

Brush, T. A. (1997). The effects on student achievement and attitudes when using integrated learning systems with cooperative pairs. *Educational Technology Research and Development,* **45**(1), pp. 51–64.

Campbell, R.J. (1998). HyperMinds for HyperTimes: the demise of rational, logical thought? *Educational Technology,* **38**(1), pp. 24-31.

Candlin, C. (1987). Toward task-based learning. In C. Candlin & D. Murphy (Eds.), *Language Learning Tasks* (pp. 5-22). Englewood Cliffs, N.J: Prentice Hall.

Chapelle, C. (2003). *Computer applications in second language acquisition. Foundations of teaching, testing and research.* Cambridge: Cambridge University Press.

China's Net population on the increase (2002). Retrieved October 20, 2002, from *http://www.nua.ie/surveys/.*

Coe, R. (2000). What is an "Effect Size"? Retrieved March 10, 2006, from *http://www.cemcentre.org/ebeuk/research/effectsize/ESbrief.htm*

Corti, L. (1993). Using diaries in social research. Social Research update 2, Department Of Sociology. University Of Surrey. In D. Knipe & M. Lee (2002). *The quality of teaching and learning via videoconferencing.* British Journal of Educational Technology. Vol. 33, No.3, 2002.

Cronbach, L. (1975). Beyond the Two Disciplines of Scientific Psychology. American Psychologist, **30,** pp. 671-684.

Cuban, L. (2002). *Oversold & underused. Computers in the classroom.* Cambridge: Harvard University Press.

Darling-Hammond, L., & Youngs, P. (2002). Defining "highly qualified teachers:" What does "scientifically-based research" tell us? *Education Researcher,* **31**(9), pp. 13-25.

Deng, Z. Y, & Gopinathan, S. (1999). Integration of information technology into teaching: the complexities and challenges of implementation of curricular changes in Singapore. *Asia Pacific Journal of Teacher Education and Development,* **2**(1), pp. 29-39.

Denzin, N. (1970). Strategies of multiple triangulation. In N. Denzin (Ed.) *The research act in sociology: a theoretical introduction to sociological method,* (pp. 297-313). New York, McGraw-Hill.

Digital Workstyle: the new world of work (2005). Retrieved July 19, 2005, from *http://www.microsoft.com/billgates/speeches/2005/05-19ceosummit.asp.*

Edge, J. (2000). *Action Research.* USA: TESOL.

Fisher, C., Dwyer, D. C. & Yocam, K. (1996). *Education & Technology: reflections on computing in classrooms.* USA: Jossey-Bass Publications.

Fitz-Gibbon, C.T. & Morris, L.L. (1987). *How to analyze data.* Newbury Park: Sage Publications.

Flick, U. (1998). *An introduction to qualitative research.* London: Sage Publications.

Freeman, M. (1998). Video conferencing: a solution to the multi-campus large classes problem? *British Journal of Educational Technology.* **29** (3), pp. 197-210.

Gates, B. (1996). *The road ahead.* New York: Penguin.

Gibbs, G.R. (1999). Learning how to learn using a virtual learning environment for philosophy. *Journal of Computer Assisted Learning,* **15**, pp. 221-231.

Gilster, P. (1997). *Digital Literacy.* New York: John Wiley & Sons.

Goh, C.T. (1997). Thinking Schools, Learning Nations. Extract of speech by Singapore Prime Minister Goh Chok Tong at the opening of the 7th International Conference on Thinking. Retrieved April, 10, 2003, from *http://www1.worldbank.org/Education/Globaleducationreform.*

Goh, C. T. (1998). Forward. In Chiang, M (Ed), *From economic debacle to economic miracle: the history of development of technical education in Singapore* (p. 7) Singapore: Times Editions.

Goodyear, P. (2001). Psychological foundations for networked learning. In C. Steeples & C. Jones (Eds), *Networked learning: perspectives and issues.* London: Springer Verlag.

Guba, E.G. & Lincoln, Y.S. (1981). *Effective evaluation: improving the usefulness of evaluation results through responsive and naturalistic approaches.* San Francisco: Jossey-Bass, Inc.

Hesselbring, T., Barron, L. & Risko, V. (2000). Uses of technology in standards-based teacher education. *NPEAT Project* 2.1.4.

Healy, J.M. (1999). *Failure to connect.* New York: Touchstone.

Hu, C., Wong, P., Wong, A., Cheah., H.M. & D'Rozario, V. (2004). An evaluation of a teacher training institution's effort in preparing pre-service teachers in the use of ICT.

Paper presented at *ED-MEDIA 2004 - World Conference on Educational Multimedia, Hypermedia & Telecommunications,* Lugano, Switzerland, June 21-26, 2004

Immediate outcomes of education (2004). Retrieved July 19, 2005, from *http://www.moe.gov.sg/corporate/desired_outcomes4.htm.*

IM programs draw US kids and teens online (2002). Retrieved October 20, 2002, from *http://www.nua.ie/surveys/.*

Internet access in US public schools and classrooms: 1994 to 2001 (2002). *National Center for Education Statistics.* Retrieved June 6, 2004, from *http://nces.ed.gov/pubs2002/internet/3.asp.*

Jonassen, D.H., Peck, K.L. & Wilson, B.G. (1999). *Learning with technology: a constructivist perspective.* Prentice-Hall: New Jersey.

Jonassen, D.H., Myers, J.M. & McKillop, A.M. (1996). From constructivism to constructionism. Learning with hypermedia/multimedia rather than from it. In B.G. Wilson, (Ed), *Constructivist learning environments: Case studies in instructional design* (pp.93-106). Englewoods Cliffs, NJ: Educational Technology Publications.

Jones, C. & Asensio, M. (2000). Designs for networked learning in Higher Education: a phenomenograpic investigation of practitioners' accounts in design. In C. Steeples & C. Jones (Eds) *Networked learning: perspectives and issues.* London: Springer Verlag.

Jordan, W. R. & Follman, J. M. (Eds.). (1993). *Using technology to improve teaching and learning. Hot topics: usable research.* (ERIC document reproduction service No. ED355930).

Kemmis, S. & McTaggart, R. (1988). *The Action Research planner, 3rd edition*. Geelong: Deakin University.

Kennedy, M. (1999). Form and substance in mathematics and science professional development. *National Institute for Science Education,* **3**(2), pp. 1-7. In T. Hesselbring, L. Barron, & V. Risko (2000). *Uses of technology in standards-based teacher education.* NPEAT Project 2.1.4.

Knipe, D. & Lee, M. (2002). The quality of teaching and learning via videoconferencing. *British Journal of Educational Technology*. Vol. 33, No.3.

Knowles, M. (1984). *Andragogy in action.* San Francisco: Jossey-Bass.

Kraut, R.V., Lundmark, V., Patterson, M., Kiesler, S., Mukopadhay, T. & Scherlis, W. (1998). Internet Paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist,* **53**(9), pp. 1017-1031.

Kress, G. R. (2003). *Literacy in the new media age.* USA: Routledge.

Kulik, J. A. (1994). Meta analytic studies of findings on computer based instruction. In *Report on the effectiveness of technology in schools 95-96.* New York: Software Publishers Association.

Levy, P. (2003). A methodological framework for practice-based research in networked learning. In *Instructional Science.* **31**. pp. 87-109.

Lim, C.P. (2004). *ICT integration into education: A Case Study of Singapore*. Singapore: McGraw Hill Education.

Locke, R.J., Spirduso, W.W. & Silverman, S.J. (1987). *Proposals that work: a guide to planning dissertations and grant proposals.* Newbury Park: Sage Publications.

Lortie, D.C. (1996). Schoolteacher. In C. Fisher, D.C. Dwyer, & K. Yocam. *Education & Technology: Reflections on computers in the classroom.* USA: Jossey Bass.

Loveless, A., Devoogd, G.L & Bohlin, R.M. (2000). Something old, something new...is pedagogy affected by ICT? In A. Loveless & V. Ellis (Eds) *ICT, Pedagogy and the Curriculum.* London and New York: Routledge Falmer.

MAPE: Micros And Primary Education (2002). Retrieved October 20, 2002, from *http://www.mape.org.uk/curriculum/english/english.htm.*

Marx, K. (1990). *Capital Volume 1, 12th edition.* UK: Penguin Classics.

Matthews, J. G. (1998). Predicting teacher perceived technology use: needs assessment model for small rural schools. (ERIC Document Reproduction Service No. ED 418 828). In Hasselbring, T.S., Barron, L. & Risko, V. (2000). Uses of technology in standards-based teacher education. *NPEAT Project* 2.1.4.

McEwen, A., McGuiness, C. & Knipe, D. (2001). Teaching and cognitive outcomes in A-level and advanced GNVQs: case studies from science and business studies classrooms. *Research papers in education.* **16** (2), pp. 199-222.

McGrath, B. (1998). Partners in learning: twelve ways technology changes the teacher-student relationship. *T.H.E. Journal,* **25** (9), pp. 58-61.

McNeil, B.J. & Nelson, K. R. (1991). Meta-analysis of interactive video instruction: a 10-year review of achievement effects. *Journal of Computer-based Instruction,* **18** (1), pp. 1-6.

Merriam, S. B. (1988). *Case study research in education: a qualitative approach.* USA: Jossey-Bass.

Merriam, S. B. (1998). *Qualitative research and case study applications in education.* San Francisco: Jossey-Bass.

Merriam, S. B., & Simpson, E. L. (1984). *A guide to research for educators and trainers of adults.* Florida: Robert E. Krieger.

Miles, M. & Huberman, M. (1984). *Qualitative data analysis.* Beverly Hills: Sage Publications.

Ministry of Education, Singapore (2002). Masterplan II for IT in Education. Retrieved October 20, 2002, from *http://www.moe.gov.sg/edumall/mp2/mp2_home.htm.*

Ministry of Finance (2001). Government expenditure. Retrieved April 10, 2003, from *http://www.mof.gov.sg.*

MOE (2004). Teach less. Learn more. Retrieved July 19, 2005, from *http://www.moe.gov.sg:80/bluesky/print_tllm.htm.*

Montieth, M. & Smith, J. (2001). Learning in a virtual campus: the pedagogical implications of students' experiences. *Innovations in Education and Teaching International,* **38** (2), pp.119-132.

Morrison, D. & Collins, A. (1996). Epistemic fluency and constructivist learning environments. In B.G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp.107 - 119). Englewood Cliffs, NJ: Educational Technology Publications.

Mouza, C. (2002). Learning to teach with new technology: implications for professional development. *Journal of Research on Technology in Education.* Winter 2002-2003. Volume **35** Number 2.

National Council for Education Statistics (1999). Teacher quality: a report on the preparation and qualifications of public school teachers. *NCES 1999-080.* Washington D.C : U.S. Government Printing Office.

New London Group (1996). A pedagogy of multiliteracies: designing social futures. *Harvard Educational Review,* Vol. **66**, No. 1, Spring 1996.

Noble, D.F. (1998). Digital diploma mills. Retrieved April 11, 2000, from *http://www.communication.ucsd.edu/dl/ddm3.html.*

Nunan, D. (1989). *Designing tasks for the communicative classroom.* Cambridge: Cambridge University Press.

OECD (2001). Schooling for tomorrow - learning to change: ICT in schools. Retrieved July 20, 2004, from *http://www1.oecd.org/publications/e-book/9601131E.pdf.*

Parr, J. (2003). A review of the literature on computer-assisted learning, particularly integrated learning systems, and outcomes with respect to literacy and numeracy. Retrieved 6 June, 2004, from *http://www.minedu.govt.nz/.*

Patton, M. Q. (1980). *Qualitative evaluation methods.* London: Sage Publications.

Pavri, F. (1998). Plugged in, spaced out: what's the relevance of computers in education? In *Educating for the Good Society. The National University of Singapore Society,* Volume **15**, 1998. MITA (P) No. 204/01/99.

Postman, N. (1992). **Technopoly.** New York: Vintage Books.

Punch, K. F. (1998). *Introduction to social research. Quantitative & qualitative approaches.* Thousand Oaks: Sage Publications.

Revell, P (2003). Unfinished business. The Guardian. Retrieved July 2, 2003, from *http://education.Guardian.co.uk/Elearning/Story/0,10577,973854,00.Html.*

Russel, M., Bebbel, D., O'Dwyer, L. & O'Connor, K. (2003). *Teachers beliefs about and use of technology: enhancing the use of technology for new and veteran teachers.* Boston, MA: Boston College, Technology and Assessment Study Collaborative.

Ryan, A. W. (1990). Meta-analysis of achievement effects of microcomputer applications in elementary schools. *Educational Administration Quarterly,* **27**(2), pp. 161-184. In *Report on the effectiveness of technology in schools 95-96.* New York: Software Publishers Association.

Salmon, G. (2002). *E-tivities: the key to active online learning.* USA: Kogan Page.

Salomon, G. (1993). *Distributed cognitions: psychological and educational considerations.* New York: CUP.

Sandholtz, J.M., Ringstaff, C. & Dwyer, D.C. (1997). *Teaching with technology: creating student-centered classrooms.* New York: Teachers College Press.

Scardamalia, M. & Bereiter, R. (1996). Adaptation and understanding: A case for new cultures of schooling. In S. Vosniadou, E. De Corte, R. Glaser, & H. Mandl (Eds.), *International perspectives on the design of technology-supported learning environments* (pp.149-163). Mahwah, NJ: Lawrence Erlbaum Associates.

Scardamalia, M., Bereiter, C. & Lamon, M. (1994). The CSILE project: Trying to bring the classroom into world 3. In K. McGilly (Ed.), *Classroom lessons: integrating cognitive theory and classroom practice* (pp. 201-228). Cambridge, MA: Bradford Books/MIT Press.

Schacter, J. (1999). The impact of education technology on student achievement: what the most current research has to say. Retrieved July 25, 2004, from *http://www.milkenexchange.org.*

Schuell, T. (1992). Designing instructional computing systems for meaningful learning. In M. Jones, & P. Winne (Eds) *Adaptive learning environments.* New York: Springer Verlag.

Schrum, L., Skeele, R., & Grant, M. (2002-2003). Revisioning learning in a college of education: the systemic integration of computer based technologies. *Journal of Research on Technology in Education,* **35**(2), pp. 256-271.

Selinger, M. (1997). Open learning, electronic communications and beginning teachers. *European Journal of Teacher Education,* **20** (1), pp.71-84.

Selwyn, N. (1997). Teaching information technology to the computer shy: a theoretical approach to a practical problem. *Journal of Vocational Education and Training*, Vol. **49**, No. 3, pp. 395-408.

Sieber, J. E. (1982). Deception in social research 1: kinds of deception and the wrongs they may involve. *IRB: A Review of Human Subjects Research,* **4** (9), pp. 1-5.

Silver, R, Hu, G. & Iino, M. (2002). *English language education in China, Japan and Singapore.* Singapore: National Institute Of Education.

Sivin-Kachala, J. & Bialo, E. (1996). *Report on the effectiveness of technology in schools, 1995-96.* Washington, DC: Software Publishers Association.

Steeples, C, Jones, C.R, & Goodyear, P. (2000). Beyond E-learning: a future for networked learning. In C. Steeples and C. Jones, (Eds) *Networked learning: perspectives and issues.* London: Springer Verlag.

Stoll, C. (1999). *High-Tech Heretic.* New York: Anchor.

Stotts, D., Smith, J. & Gyllstrom. K. (2003). Single and dual-user web browsing in the Transparent Video Facetop. *Technical Report TR04-005.* Department of Computer Science. University of North Carolina at Chapel Hill.

Survey on InfoComm usage in households 2000 (2001). Retrieved October 20, 2002, from *http://www.ida.gov.sg.*

Tan, J. (1998). Reflections on education in Singapore: towards the 21st century. *Educating for the Good Society,* **15**, pp. 29-34.

Tan, O, L. (1998). *Leadership styles and the implementation of the IT Masterplan.* Unpublished thesis.

Tapscott, D. (1998). *Growing up digital: the rise of the net generation.* New York: McGraw-Hill.

Teo, C. H. (1997). Opening new frontiers in education with information technology : speech by RAdm Teo Chee Hean , Minister For Education and 2nd Minister for Defence at the launch of the Masterplan for IT in Education on Monday 28 April, 1997 at Suntec City at 10 A.M. Retrieved April 13, 2003, from *http://www1.moe.edu.sg/iteducation/Masterplan/Summary.Htm.*

The World Fact Book (2002). Retrieved April 2, 2003, from *http://www.cia.gov/cia/publications/factbook/print/sn.html.*

Tierney, R., Bresler, J. & Bond, E. (2005). *The impact of computers on the lives of ACOT graduates: a follow up study.* Ohio State University. Unpublished work in progress.

Towndrow, P.A. (2001). The role of technology and technology training in shaping educational policy: the Singaporean experience. In J, Tan, S. Gopinathan, & W.K. Ho (Eds). *Challenges facing the Singapore education system today.* Singapore: Prentice Hall.

Towndrow, P. A. & Vallance, M. (2004). *Using IT in the Language Classroom: A guide for teachers and students in Asia. 3rd Edition.* Singapore: Longman.

Trotter, A. (1999). Preparing teachers for the digital age. *Education Week,* **19** (4), pp. 37-43.

Tsu, Gary Chin Sun. (2000). *Concerns-based adoption model (CBAM) development profile of teachers in the IT Masterplan implementation.* Unpublished thesis.

Tyler, C. (1999). Beyond the content – video conferencing. *Speaking English,* **32** (2), pp. 15-27.

U.S. Department of Education, National Center for Education Statistics. (2000). Teacher quality: a report on the preparation and qualifications of public school teachers, *NCES 1999-080,* by L. Lewis, B.Parsad, N. Carey, N. Bartfai, E. Farris, & B. Smerdon. Washington, DC: U.S. Government Printing Office.

Vallance, M. (2004). Blogging. Modern English Teacher **13** (1), pp. 51-54. UK: MET Publishing.

Vallance, M. (2005). The challenge of informed use: a unique IT experience for teachers and students from the Peoples' Republic of China. *The Journal of Asia TEFL,* Vol. 2, No. 1, pp. 55-73, Spring 2005.

Watts, M. & Lloyd, C. (2000). A classroom evaluation of Espresso for schools. In BECTA (2003). *A review of the research literature on the use of MLES and VLES in* *education.* Retrieved July 2, 2003, from *http://www.Becta.org.uk/Research/Reports/Vle.Cfm.*

Wenger, E. (1998). *Communities of practice. Learning, meaning and identity.* Cambridge: CUP.

Wettasinghe, C.M. (2002). *A descriptive study of the change and learning patterns of Singapore Government Primary school teachers in relation to their integration of information technology in education.* USA: UMI Dissertation Services

Wiseman, D. C. (1999). *Research Strategies for Education.* USA: ITP

Wood, D., Underwood, J. & Avis, P. (1999). Integrated learning systems in the classroom. *Computers & Education,* **33** (2-3), pp. 91-108.

Woodhall, M. (1997). Human capital concepts. In A. H. Halsey, H. Lauder, P. Brown & A. S. Wells (Eds.), *Education: culture, economy and society* (pp. 219-223). Oxford: Oxford University Press.

Yeo, G. (1999). Digital information society in the new century. Retrieved April 13, 2003, from *http://www.sedb.com/edbcorp/.*

Zhong, Y.X. & Shen, H.S. (2002). Where is the technology induced pedagogy? Snapshots from a multimedia EFL classroom. *British Journal of Educational Technology,* **33** (1), pp. 39-52.

Appendix

Appendix 1
Instrument – survey forms and glossary.

Appendix 2
Quantitative data – week-by-week.

Appendix 3
Quantitative data – synchronous (SYNCH) and non-synchronous (NO SYNCH) collated.

Appendix 4
Quantitative data – synchronous (SYNCH) teacher and students' data collated.

Appendix 5
Calculation for Breadth of Learning.

Appendix 6
Transcripts of synchronous (SYNCH) tasks – a sample transcript.

Appendix 7
Interviews - a sample transcript.

Appendix 8
Bulletin Board System (BBS) postings – a sample.

Appendix 9
Competencies – sample of competencies exemplified.

Appendix 10
Researcher's BLOG – sample.

Appendix 11
Consent form.

Appendix 12
Course syllabus and synchronous (SYNCH) lesson outlines.

Appendix 13
Technical specifications and iStorm instructions.

Appendix 14
DVD containing demonstrations of the digital capture of data.

Appendix 15
Illustrative poster representation of the Case Study research.

Appendix 1
Instrument – survey forms and glossary.

ACTIVITIES	Whether activity took place		COGNITIVE OUTCOMES	Extent to which they took place					
INFO	YES	NO	TERMS	0	1	2	3	4	5
EXPLAN	YES	NO	MEMORY	0	1	2	3	4	5
INSTRUCT	YES	NO	UNDERSTAND	0	1	2	3	4	5
GUIDE	YES	NO	VIEWPOINTS	0	1	2	3	4	5
NOTES	YES	NO	CONSOLIDATE	0	1	2	3	4	5
WORKNOTES	YES	NO	NEW IDEAS	0	1	2	3	4	5
READ	YES	NO	CRITICAL	0	1	2	3	4	5
QUESTION	YES	NO	OWN EXPLNATION	0	1	2	3	4	5
GROUPS	YES	NO	PROBLEM	0	1	2	3	4	5
EXERCISE	YES	NO	SPECIFIC SKILLS	0	1	2	3	4	5
PLAN	YES	NO	CORE SKILLS	0	1	2	3	4	5
IT	YES	NO	DECISIONS	0	1	2	3	4	5
EQUIPMENT	YES	NO	APPLICATION	0	1	2	3	4	5
MATERIAL	YES	NO	AESTHETIC	0	1	2	3	4	5
PRESENT	YES	NO	VALUES	0	1	2	3	4	5
PLACE	YES	NO	OTHER	0	1	2	3	4	5
REVISE	YES	NO	CONNECTIONS	0	1	2	3	4	5
OTHER	YES	NO							

GENERIC COMPETENCIES (MAIN)
GENERIC COMPETENCIES (SECONDARY)

EPISTEMIC COMPETENCIES (MAIN)

DECLARATIVE COMPETENCIES (MAIN)
DECLARATIVE COMPETENCIES (SECONDARY)

TEACHER DIRECTED ACTIVITIES

STUDENT GENERATED ACTIVITIES

STUDENT WEEKLY SURVEY

Date:
Duration of lesson:

Classroom activity categories Which of the following classroom activities took place during the lesson/session? Refer to glossary	**Yes/No** Whether activity took place		**Intended cognitive outcomes** To what extent did the following figure in this lesson? Refer to glossary.	**0 1 2 3 4 5** Extent to which they took place					
INFO	YES	NO	TERMS	0	1	2	3	4	5
EXPLAN	YES	NO	MEMORY	0	1	2	3	4	5
INSTRUCT	YES	NO	UNDERSTAND	0	1	2	3	4	5
GUIDE	YES	NO	VIEWPOINTS	0	1	2	3	4	5
NOTES	YES	NO	CONSOLIDATE	0	1	2	3	4	5
WORKNOTES	YES	NO	NEW IDEAS	0	1	2	3	4	5
READ	YES	NO	CRITICAL	0	1	2	3	4	5
QUESTION	YES	NO	OWN EXPLAN	0	1	2	3	4	5
GROUPS	YES	NO	PROBLEM	0	1	2	3	4	5
EXER	YES	NO	CORE SKILLS	0	1	2	3	4	5
PLAN	YES	NO	DECISIONS	0	1	2	3	4	5
IT	YES	NO	APPLIC	0	1	2	3	4	5
PRESENT	YES	NO	VALUES	0	1	2	3	4	5
REVISE	YES	NO	OTHER	0	1	2	3	4	5
OTHER	YES	NO	CONNECTIONS	0	1	2	3	4	5
COMMENTS?			COMMENTS?						

GLOSSARY OF TERMS- STUDENT

Classroom activities

CATEGORY	ABBREVIATION	FURTHER EXPLANATION
Receive information	INFO	Students receive a body of information where the emphasis is on terminology, facts and/or formulae.
Give explanation	EXPLAN	The teacher goes beyond factual knowledge to describe theories, interpret facts and/or analyse concepts.
Give instructions	INSTRUCT	Students are told how to complete a task.
Give guidance	GUIDE	Students are guided as they complete a task
Note taking	NOTES	Students take notes from the teacher
Working with notes	NOTES	Students work through handouts or previously given notes
Reading	READ	Students read or study materials independently
Questions/ answers	QUESTION	Students and teacher engage in prolonged question and answer sessions
Group discussion	GROUPS	Students discuss topic in pairs or groups
Exercises	EXERCISE	Students complete set tasks, e.g. problem solving, worksheets, translations
Planning	PLAN	Students and teacher plan a task, e.g. homework, essay, project.
Working with IT	IT	Students work with IT
Working with equipment	EQUIP	Students work with lab equipment or tools
Working with materials	MATERIAL	Students work with materials, e.g. in lab or studio
Making presentations	PRESENT	Students present their work to other students for comment and feedback
Preparing for work placements	PLACE	Preparation for extended work placements, e.g. teaching practice
Revision	REVISE	Going over previously learned material
Other	OTHER	Any other type of activity not adequately described in the previous categories

Cognitive outcomes

CATEGORY	ABBREVIATION	FURTHER EXPLANATION
Developing terminology	TERMS	Learning new terminology, becoming familiar with technical vocabulary
Ordering and memorising	MEMORY	Learning to structure, memorise and order well established information
Understanding	UNDERSTAND	Understanding concepts, interpreting facts, analysing ideas and arguments
Alternative viewpoints	VIEWPOINTS	Learning about alternative theories or points of view on the same subject
Consolidation	CONSOLIDATE	Consolidating previously learned materials
Producing new ideas	NEW IDEAS	Generating and combining new ideas through questions, discussion and brainstorming
Critical evaluation	CRITICAL	Learning to be critical, to question evidence and/or assumptions and to evaluate arguments
Constructing own explanation	OWN EXPLAN	Learning to construct own explanations
Problem solving	PROBLEM	Developing methods and strategies for solving problems, e.g. defining problems, considering alternatives solutions
Mastering skills- general or core	CORE SKILLS	Learning IT, communication, application of number skills, info retrieval
Decision making	DECISIONS	Learning about decision making, considering options, weighing up the pros and cons of different options, deciding on the best course of action
Applying theory to practice	APPLIC	Learning to relate theoretical knowledge to own experience, to applications and /or to specific examples
Values	VALUES	Identifying the values underpinning areas of enquiry, developing a sense of own values
Other	OTHER	Any other type of cognitive outcome not covered by previous categories
Connections	CONNECTIONS	Refers to whether you explicitly connected the learning to any other area of your teaching experiences such as everyday activities, use at school, other subjects.

TEACHER DIARY PAGE

Date:
Duration of lesson:

Classroom activity categories Which of the following classroom activities took place during the lesson/session? Refer to glossary	**Yes/No** Whether activity took place		**Intended cognitive outcomes** To what extent did the following figure in this lesson? Refer to glossary.	**0 1 2 3 4 5** Extent to which they took place					
INFO	YES	NO	TERMS	0	1	2	3	4	5
EXPLAN	YES	NO	MEMORY	0	1	2	3	4	5
INSTRUCT	YES	NO	UNDERSTAND	0	1	2	3	4	5
GUIDE	YES	NO	VIEWPOINTS	0	1	2	3	4	5
NOTES	YES	NO	CONSOLIDATE	0	1	2	3	4	5
WORKNOTES	YES	NO	NEW IDEAS	0	1	2	3	4	5
READ	YES	NO	CRITICAL	0	1	2	3	4	5
QUESTION	YES	NO	OWN EXPLAN	0	1	2	3	4	5
GROUPS	YES	NO	PROBLEM	0	1	2	3	4	5
EXER	YES	NO	CORE SKILLS	0	1	2	3	4	5
PLAN	YES	NO	DECISIONS	0	1	2	3	4	5
IT	YES	NO	APPLIC	0	1	2	3	4	5
PRESENT	YES	NO	VALUES	0	1	2	3	4	5
REVISE	YES	NO	OTHER	0	1	2	3	4	5
OTHER	YES	NO	CONNECTIONS	0	1	2	3	4	5
COMMENTS?			COMMENTS?						

Teacher review of the week

Learning to learn: refers to the knowledge which students acquire about their own learning habits and strategies and how they organise themselves as learners. This section attempts to find out how successful students were in doing this.

Looking back over the week's activities in the classroom, on a scale of 0 – 5 to what extent do you feel the students learned the following?

0 = not at all **5 = to a very large extent**

Students' learning	0 1 2 3 4 5					
Sources of information; learning to find and use sources of information, e.g. books, libraries, people, CD-ROMS, the Internet, etc	0	1	2	3	4	5
Planning and self monitoring; learning about planning and monitoring own progress, time management	0	1	2	3	4	5
Independent learning; learning to take initiative, to make judgements, and to direct own learning	0	1	2	3	4	5
Feedback; learning how to receive and use feedback from the teacher and/ or other students	0	1	2	3	4	5
Confidence; gaining confidence in themselves as learners	0	1	2	3	4	5
Working as a team; learning how to work as a member of a group	0	1	2	3	4	5
Communication; developing communication skills in speaking and writing	0	1	2	3	4	5

GLOSSARY OF TERMS- TEACHER

Classroom activities

CATEGORY	ABBREVIATION	FURTHER EXPLANATION
Give information	INFO	Transmitting and ordering a body of information where the emphasis is on terminology, facts and/or formulae.
Give explanation	EXPLAN	Going beyond factual knowledge to describe theories, interpret facts and/or analyse concepts.
Give instructions	INSTRUCT	Telling students how to complete a task.
Give guidance	GUIDE	Guiding students as they complete a task
Note taking	NOTES	Students take notes from the teacher
Working with notes	NOTES	Students work through handouts or previously given notes
Reading	READ	Students read or study materials independently
Questions/ answers	QUESTION	Students and teacher engage in prolonged question and answer sessions
Group discussion	GROUPS	Students discuss topic in pairs or groups
Exercises	EXERCISE	Students complete set tasks, e.g. problem solving, worksheets, translations
Planning	PLAN	Teacher and student plan a task, e.g. homework, essay, project.
Working with IT	IT	Students work with IT
Working with equipment	EQUIP	Students work with lab equipment or tools
Working with materials	MATERIAL	Students work with materials, e.g. in lab or studio
Making presentations	PRESENT	Students present their work to other students for comment and feedback
Preparing for work placements	PLACE	Preparation for extended work placements, e.g. teaching practice
Revision	REVISE	Going over previously learned material
Other	OTHER	Any other type of activity not adequately described in the previous categories

Cognitive outcomes

CATEGORY	ABBREVIATION	FURTHER EXPLANATION
Developing terminology	TERMS	Learning new terminology, becoming familiar with technical vocabulary
Ordering and memorising	MEMORY	Learning to structure, memorise and order well established information
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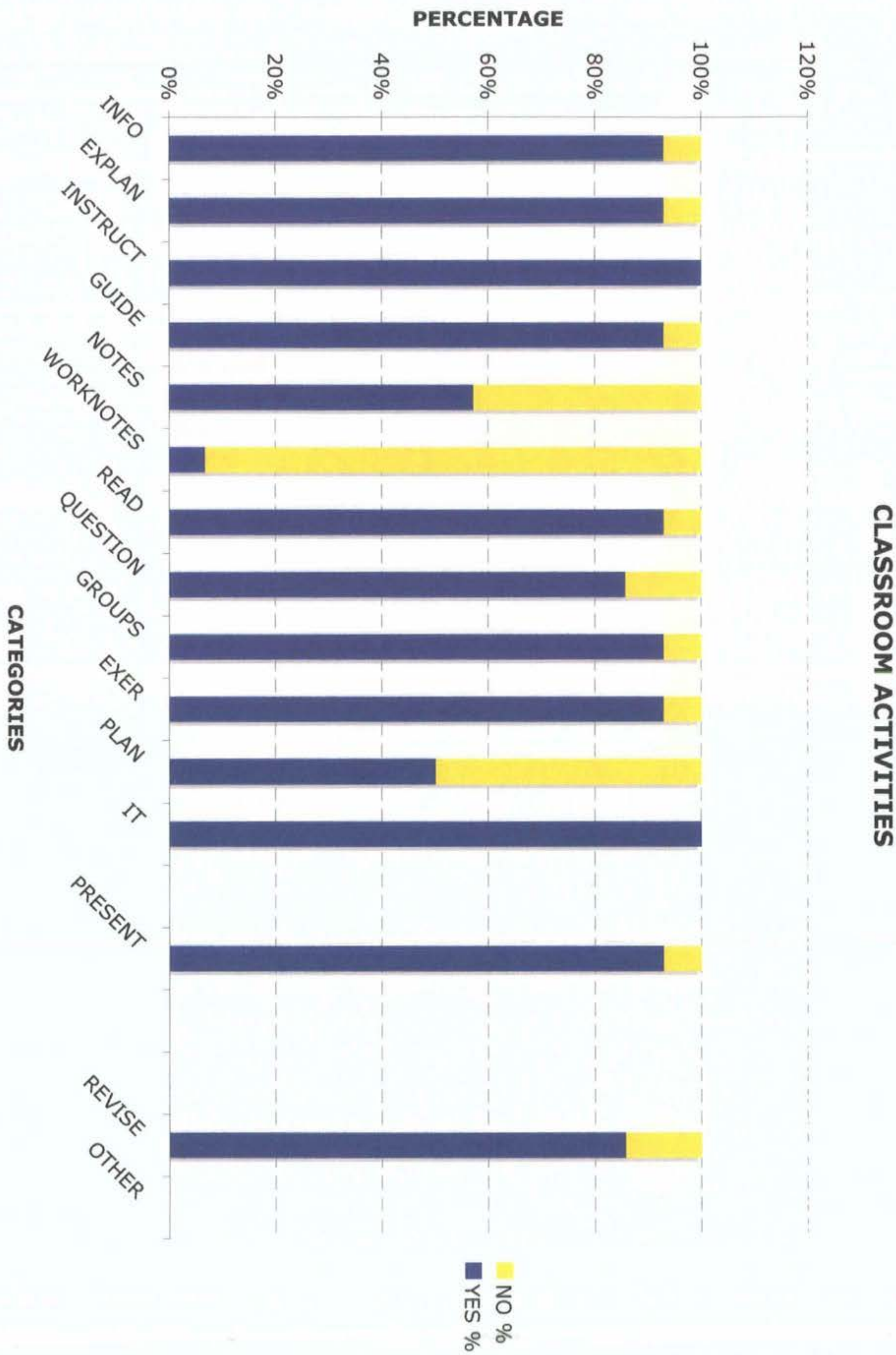
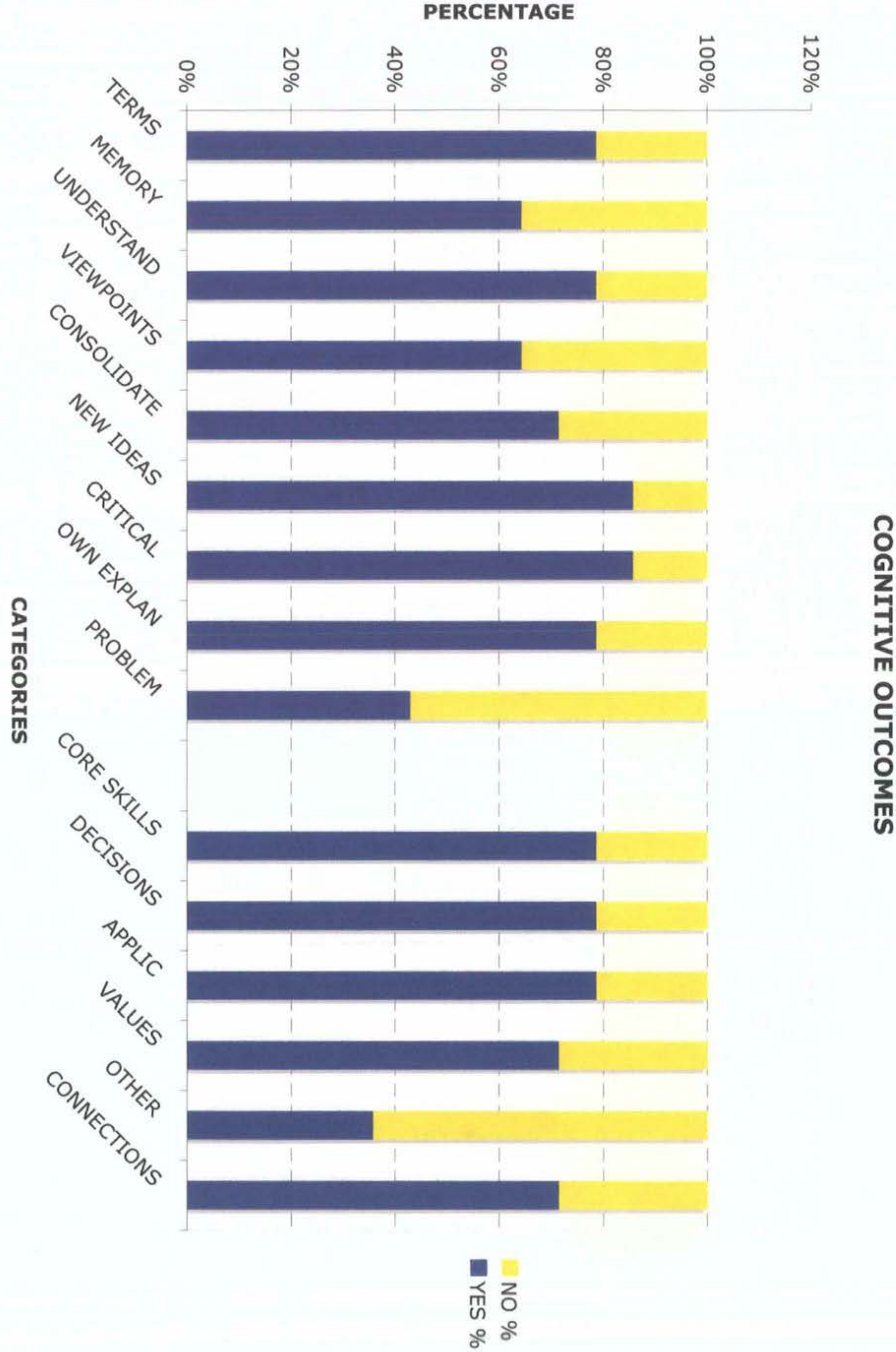
Alternative viewpoints	VIEWPOINTS	Learning about alternative theories or points of view on the same subject
Consolidation	CONSOLIDATE	Consolidating previously learned materials
Producing new ideas	NEW IDEAS	Generating and combining new ideas through questions, discussion and brainstorming
Critical evaluation	CRITICAL	Learning to be critical, to question evidence and/or assumptions and to evaluate arguments
Constructing own explanation	OWN EXPLAN	Students learning to construct own explanations
Problem solving	PROBLEM	Developing methods and strategies for solving problems, e.g. defining problems, considering alternatives solutions
Mastering skills- general or core	CORE SKILLS	Learning IT, communication, application of number skills, info retrieval
Decision making	DECISIONS	Learning about decision making, considering options, weighing up the pros and cons of different options, deciding on the best course of action
Applying theory to practice	APPLIC	Learning to relate theoretical knowledge to own experience, to applications and /or to specific examples
Values	VALUES	Identifying the values underpinning areas of enquiry, developing a sense of own values
Other	OTHER	Any other type of cognitive outcome not covered by previous categories
Connections	CONNECTIONS	Refers to whether you explicitly connected the learning to any other area of your students' experiences such as everyday activities, use at school, other subjects.

Appendix 2
Quantitative data – week-by-week.

Michael Vallance's class
Week: 1
Lesson objective/s: History of CALL Teacher marked in grey
Networking technology used: BBS, WWW

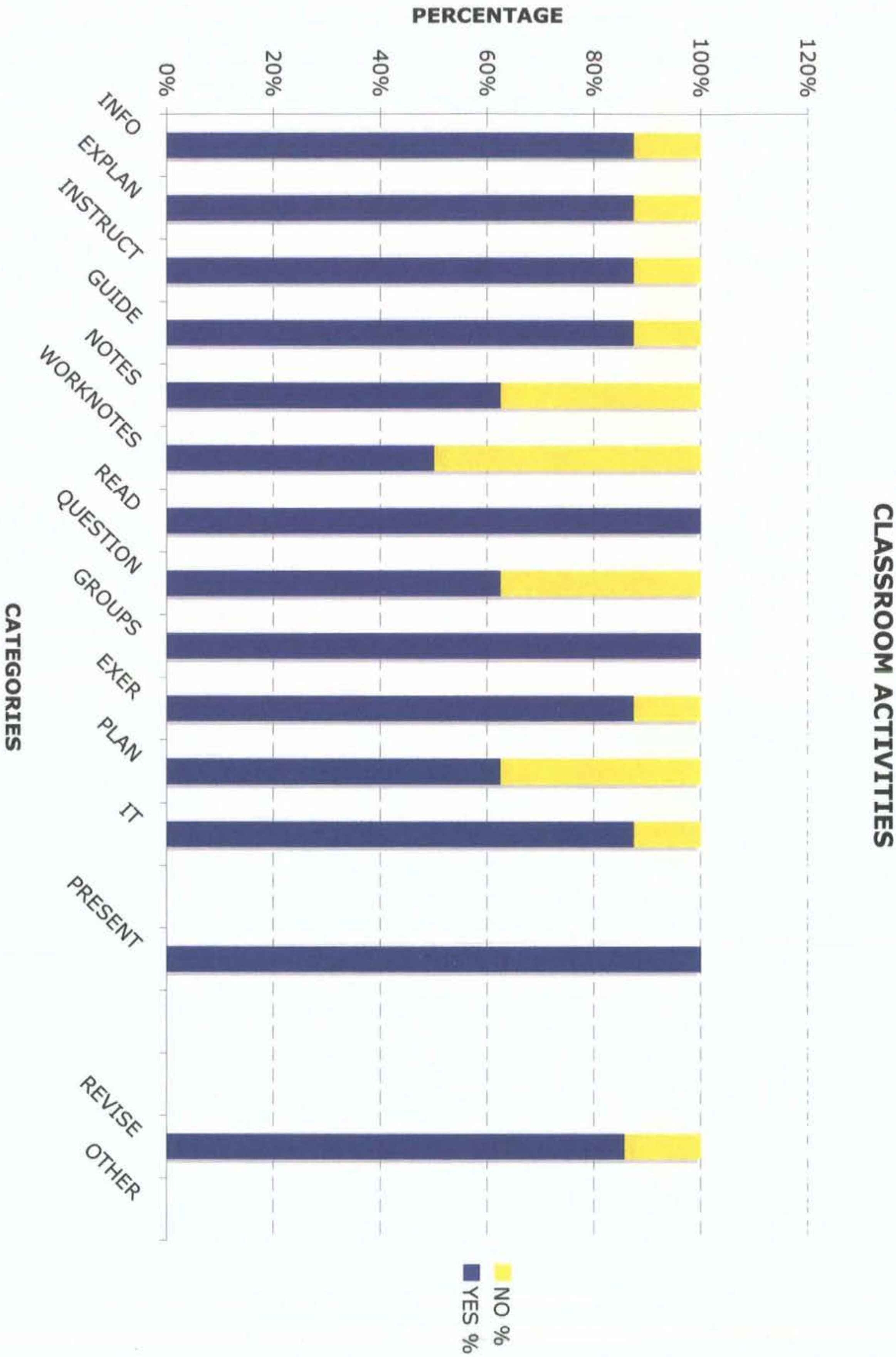
Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	93%	7%	13	1	TERMS	3	11	79%	21%	
EXPLAN	93%	7%	13	1	MEMORY	5	9	64%	36%	
INSTRUCT	100%	0%	14	0	UNDERSTAND	3	11	79%	21%	
GUIDE	93%	7%	13	1	VIEWPOINTS	5	9	64%	36%	
NOTES	57%	43%	8	6	CONSOLIDATE	4	10	71%	29%	
WORKNOTES	7%	93%	1	14	NEW IDEAS	2	12	86%	14%	
READ	93%	7%	13	1	CRITICAL	2	12	86%	14%	
QUESTION	86%	14%	12	2	OWN EXPLAN	3	11	79%	21%	
GROUPS	93%	7%	13	1	PROBLEM	8	6	43%	57%	
EXER	93%	7%	13	1						
PLAN	50%	50%	7	7	CORE SKILLS	3	11	79%	21%	
IT	100%	0%	14	0	DECISIONS	3	11	79%	21%	
					APPLIC	3	11	79%	21%	
PRESENT	93%	7%	13	1	VALUES	4	10	71%	29%	
					OTHER	9	5	36%	64%	
					CONNECTIONS	4	10	71%	29%	
REVISE	86%	14%	12	2	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences activities, future roles, other subject areas					
OTHER										

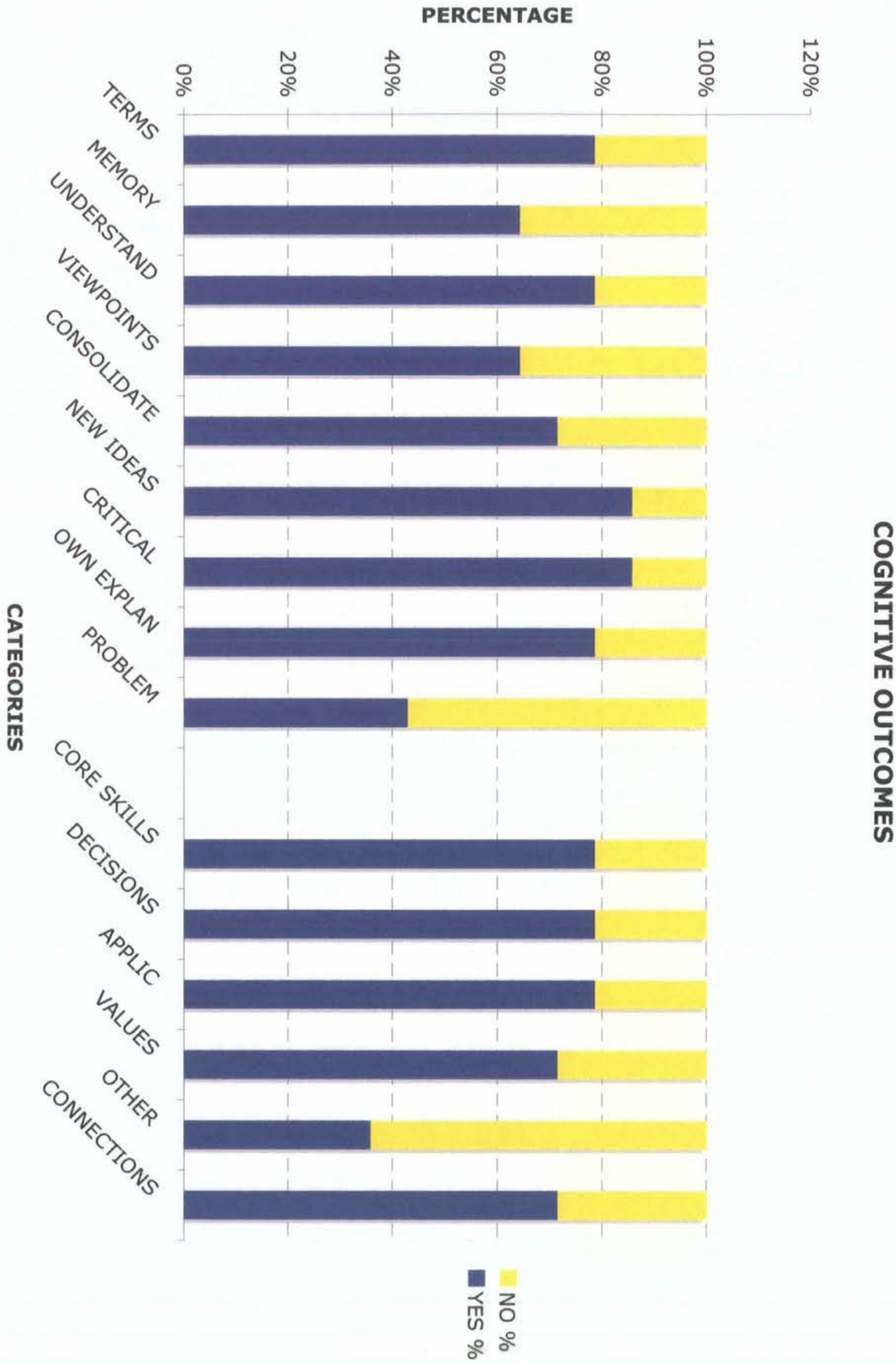

CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %


COGNITIVE OUTCOMES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
CATEGORIES
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
NO %
YES %

Michael Vallance's class
Week: 2
Lesson objective/s: IT and Policy Making   Teacher marked in grey
Networking technology used: BBS, WWW, file sharing

Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	88%	13%	7	1	TERMS	4	4	50%	50%	
EXPLAN	88%	13%	7	1	MEMORY	4	4	50%	50%	
INSTRUCT	88%	13%	7	1	UNDERSTAND	3	5	63%	38%	
GUIDE	88%	13%	7	1	VIEWPOINTS	1	7	88%	13%	
NOTES	63%	38%	5	3	CONSOLIDATE	3	5	63%	38%	
WORKNOTES	50%	50%	4	4	NEW IDEAS	3	5	63%	38%	
READ	100%	0%	8	0	CRITICAL	2	6	75%	25%	
QUESTION	63%	38%	5	3	OWN EXPLAN	2	6	75%	25%	
GROUPS	100%	0%	8	0	PROBLEM	4	4	50%	50%	
EXER	88%	13%	7	1						
PLAN	63%	38%	5	3	CORE SKILLS	2	6	75%	25%	
IT	88%	13%	7	1	DECISIONS	3	5	63%	38%	
					APPLIC	3	5	63%	38%	
PRESENT	100%	0%	8	0	VALUES	3	5	63%	38%	
					OTHER					
					CONNECTIONS	5	3	38%	63%	
REVISE	86%	14%	12	2	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences					
OTHER					activities, future roles, other subject areas					

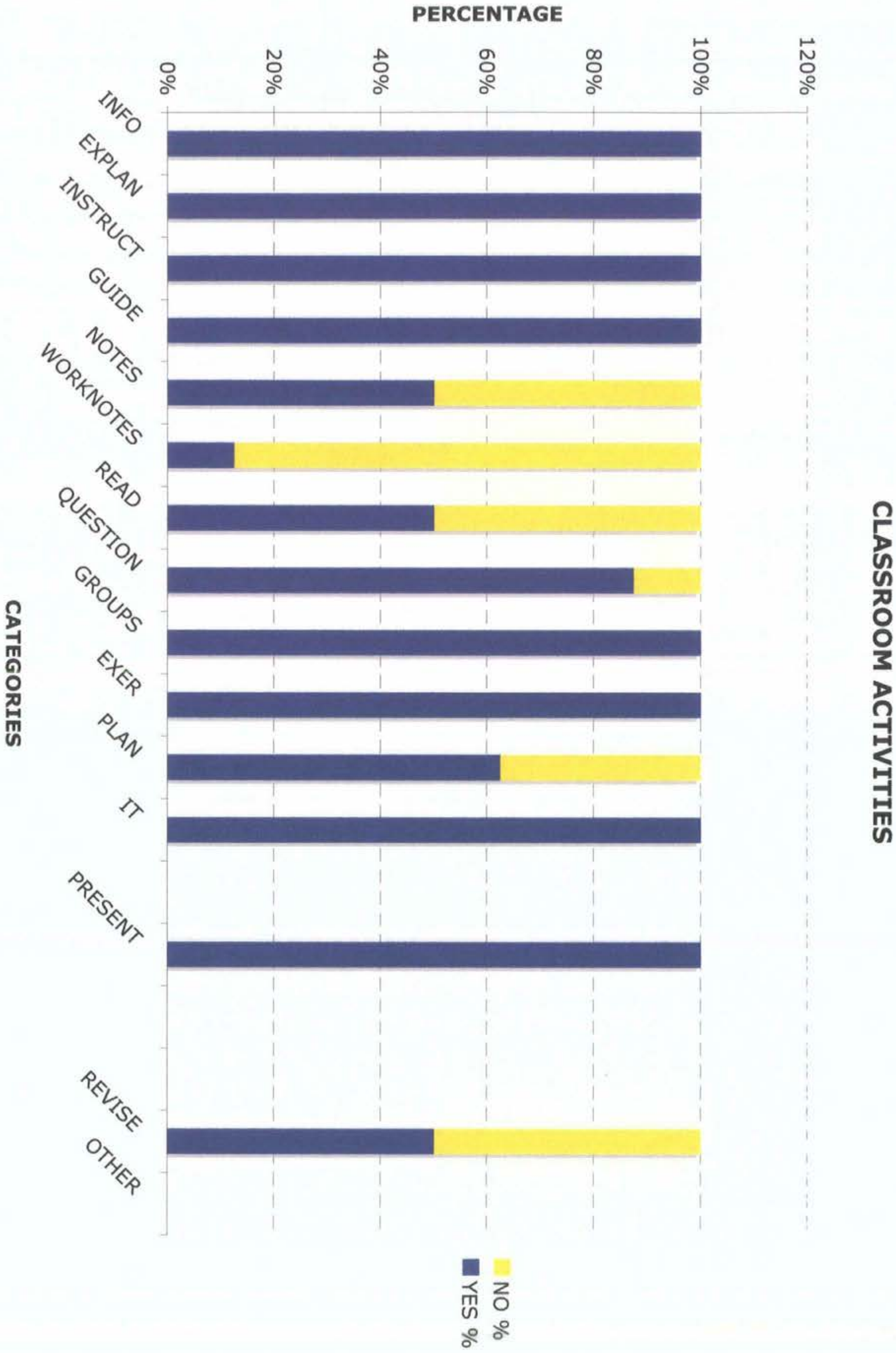

CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %



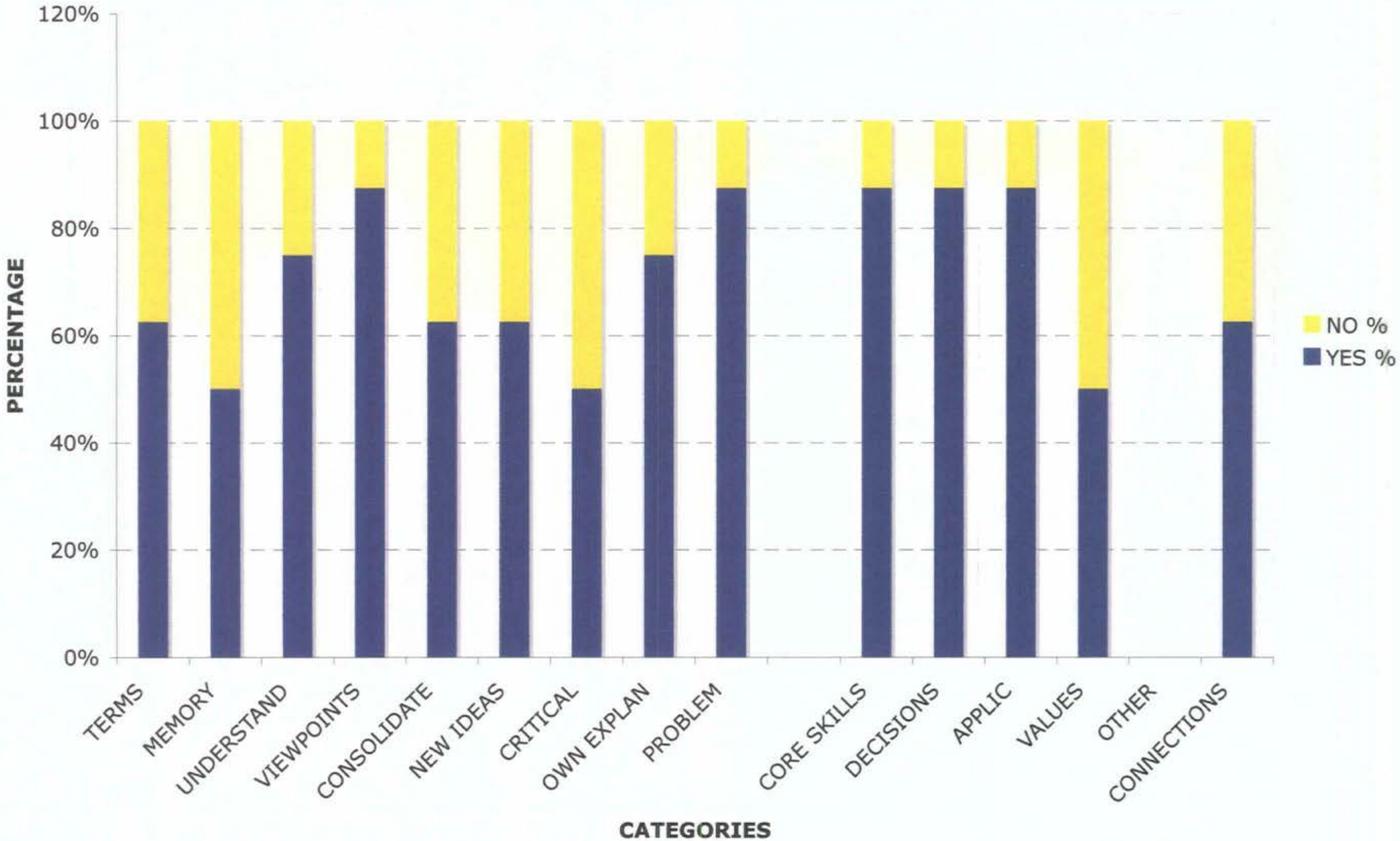
COGNITIVE OUTCOMES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
CATEGORIES
NO %
YES %

Michael Vallance's class
Week: 3
Lesson objective/s: Forming a policy making ‹ Teacher marked in grey
Networking technology used: iStorm, WWW

Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	100%	0%	8	0	TERMS	3	5	63%	38%	
EXPLAN	100%	0%	8	0	MEMORY	4	4	50%	50%	
INSTRUCT	100%	0%	8	0	UNDERSTAND	2	6	75%	25%	
GUIDE	100%	0%	8	0	VIEWPOINTS	1	7	88%	13%	
NOTES	50%	50%	4	4	CONSOLIDATE	3	5	63%	38%	
WORKNOTES	13%	88%	1	7	NEW IDEAS	3	5	63%	38%	
READ	50%	50%	4	4	CRITICAL	4	4	50%	50%	
QUESTION	88%	13%	7	1	OWN EXPLAN	2	6	75%	25%	
GROUPS	100%	0%	8	0	PROBLEM	1	7	88%	13%	
EXER	100%	0%	8	0						
PLAN	63%	38%	5	3	CORE SKILLS	1	7	88%	13%	
IT	100%	0%	8	0	DECISIONS	1	7	88%	13%	
					APPLIC	1	7	88%	13%	
PRESENT	100%	0%	8	0	VALUES	3	3	50%	50%	
					OTHER					
					CONNECTIONS	3	5	63%	38%	
REVISE	50%	50%	4	4	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences activities, future roles, other subject areas					
OTHER										

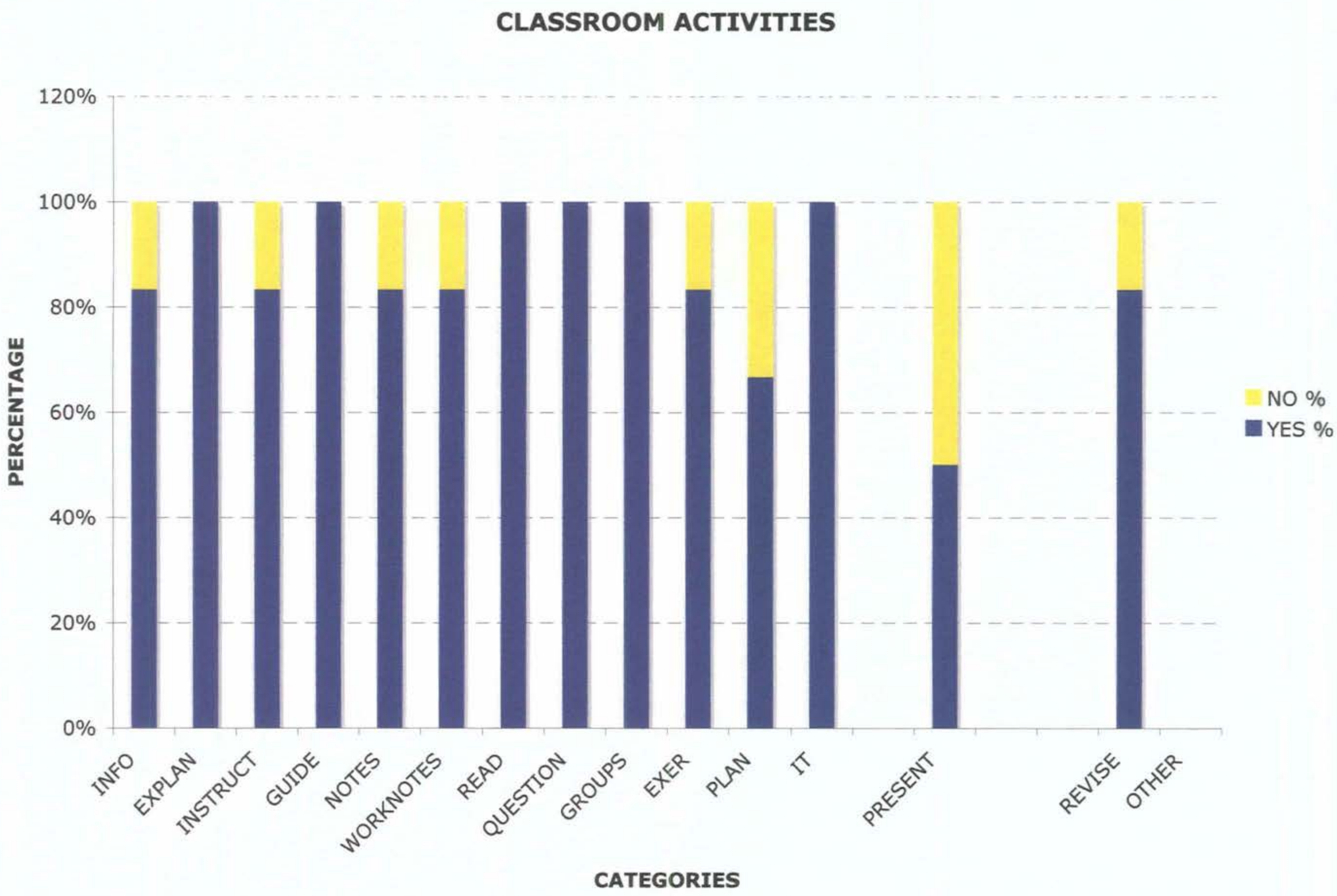

CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %

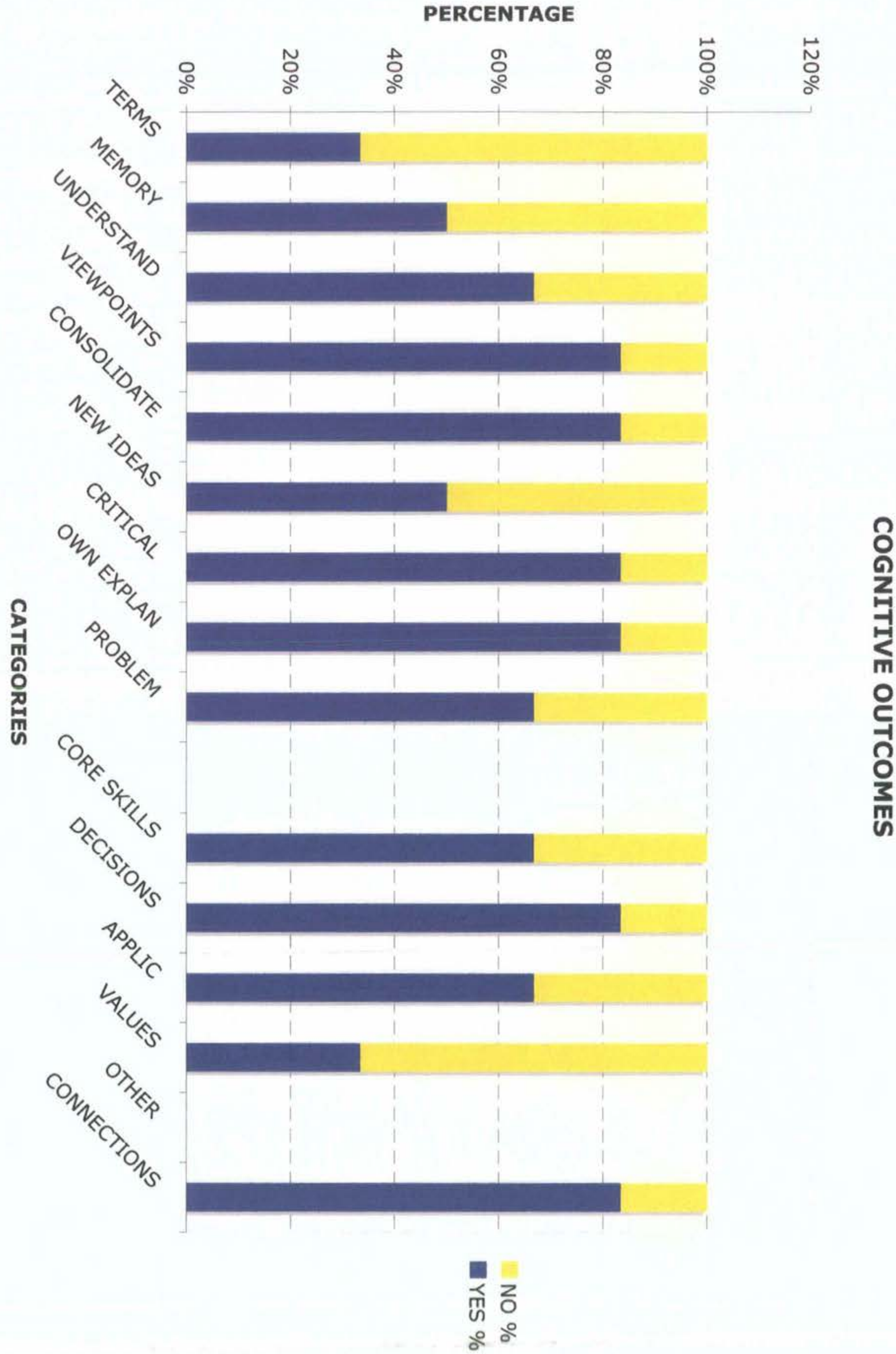
COGNITIVE OUTCOMES



Michael Vallance's class
Week: 4
Lesson objective/s: Design of digital tasks Teacher marked in grey
Networking technology used: BBS, WWW, file sharing

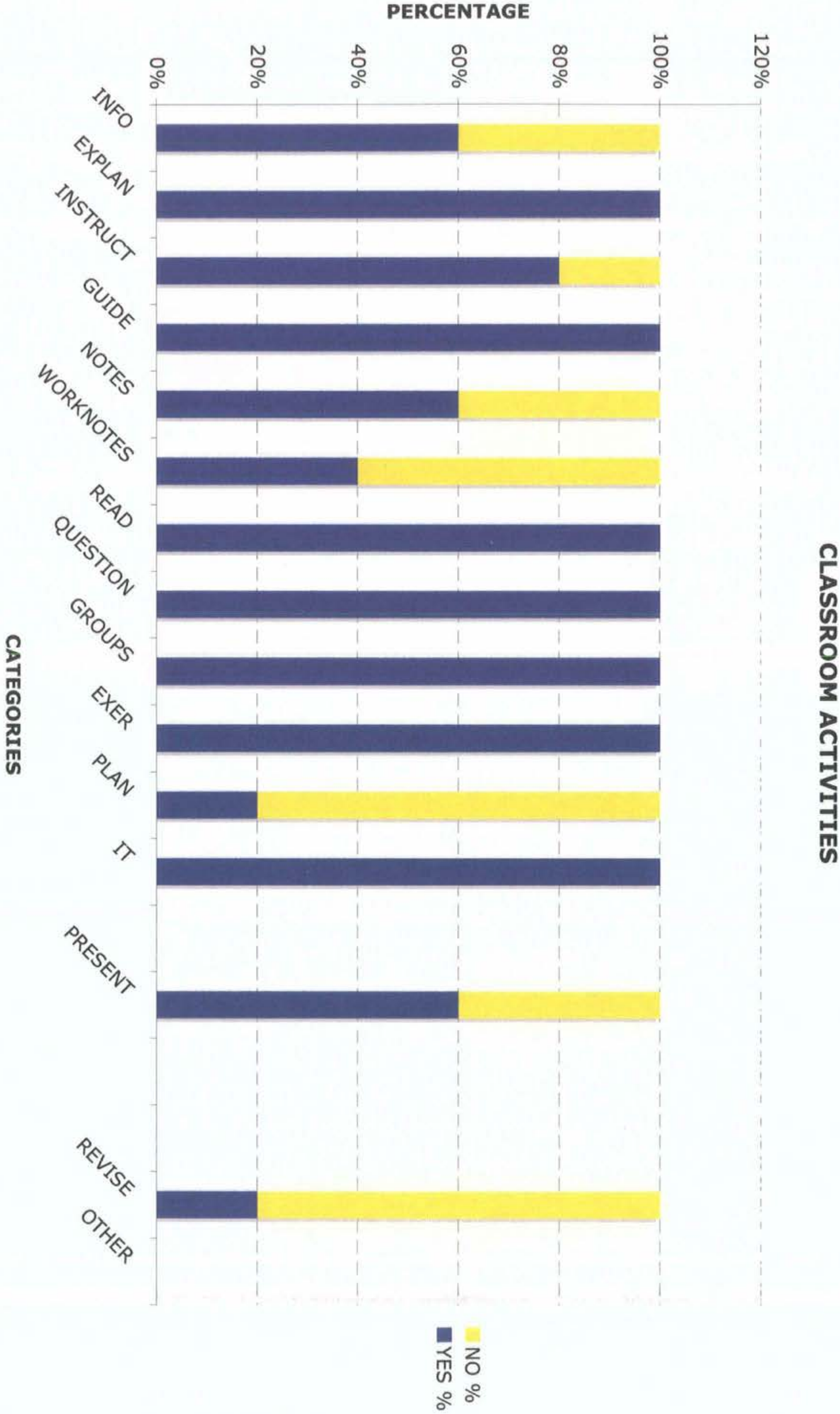
Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	83%	17%	5	1	TERMS	4	2	33%	67%	
EXPLAN	100%	0%	6	0	MEMORY	3	3	50%	50%	
INSTRUCT	83%	17%	5	1	UNDERSTAND	2	4	67%	33%	
GUIDE	100%	0%	6	0	VIEWPOINTS	1	5	83%	17%	
NOTES	83%	17%	5	1	CONSOLIDATE	1	5	83%	17%	
WORKNOTES	83%	17%	5	1	NEW IDEAS	3	3	50%	50%	
READ	100%	0%	6	0	CRITICAL	1	5	83%	17%	
QUESTION	100%	0%	6	0	OWN EXPLAN	1	5	83%	17%	
GROUPS	100%	0%	6	0	PROBLEM	2	4	67%	33%	
EXER	83%	17%	5	1						
PLAN	67%	33%	4	2	CORE SKILLS	2	4	67%	33%	
IT	100%	0%	6	0	DECISIONS	1	5	83%	17%	
					APPLIC	2	4	67%	33%	
PRESENT	50%	50%	3	3	VALUES	4	2	33%	67%	
					OTHER	0	0			
					CONNECTIONS	1	5	83%	17%	
REVISE	83%	17%	5	1	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences activities, future roles, other subject areas					
OTHER										


CLASSROOM ACTIVITIES
120%
100%
80%
60%
40%
20%
0%
PERCENTAGE
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %

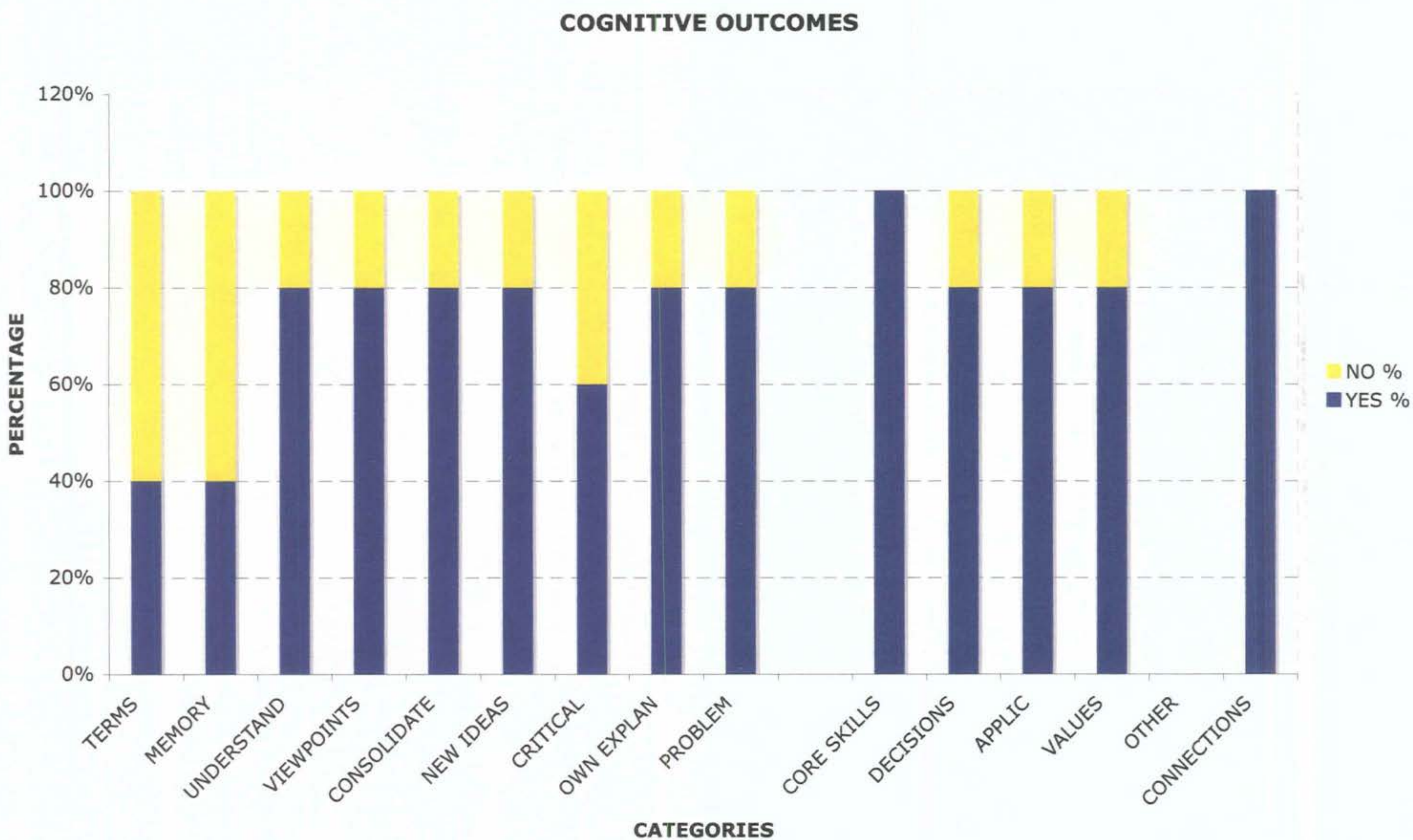

COGNITIVE OUTCOMES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
CATEGORIES
NO %
YES %

Michael Vallance's class
Week: 5
Lesson objective/s: Production of digital mate Teacher marked in grey
Networking technology used: BBS, Hot Potatoes to WWW

Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	60%	40%	3	2	TERMS	3	2	40%	60%	
EXPLAN	100%	0%	5	0	MEMORY	3	2	40%	60%	
INSTRUCT	80%	20%	4	1	UNDERSTAND	1	4	80%	20%	
GUIDE	100%	0%	5	0	VIEWPOINTS	1	4	80%	20%	
NOTES	60%	40%	3	2	CONSOLIDATE	1	4	80%	20%	
WORKNOTES	40%	60%	2	3	NEW IDEAS	1	4	80%	20%	
READ	100%	0%	5	0	CRITICAL	2	3	60%	40%	
QUESTION	100%	0%	5	0	OWN EXPLAN	1	4	80%	20%	
GROUPS	100%	0%	5	0	PROBLEM	1	4	80%	20%	
EXER	100%	0%	5	0						
PLAN	20%	80%	1	4	CORE SKILLS	0	5	100%	0%	
IT	100%	0%	5	0	DECISIONS	1	4	80%	20%	
					APPLIC	1	4	80%	20%	
PRESENT	60%	40%	3	2	VALUES	1	4	80%	20%	
					OTHER	0	0			
					CONNECTIONS	0	5	100%	0%	
REVISE	20%	80%	1	4	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences activities, future roles, other subject areas					
OTHER										

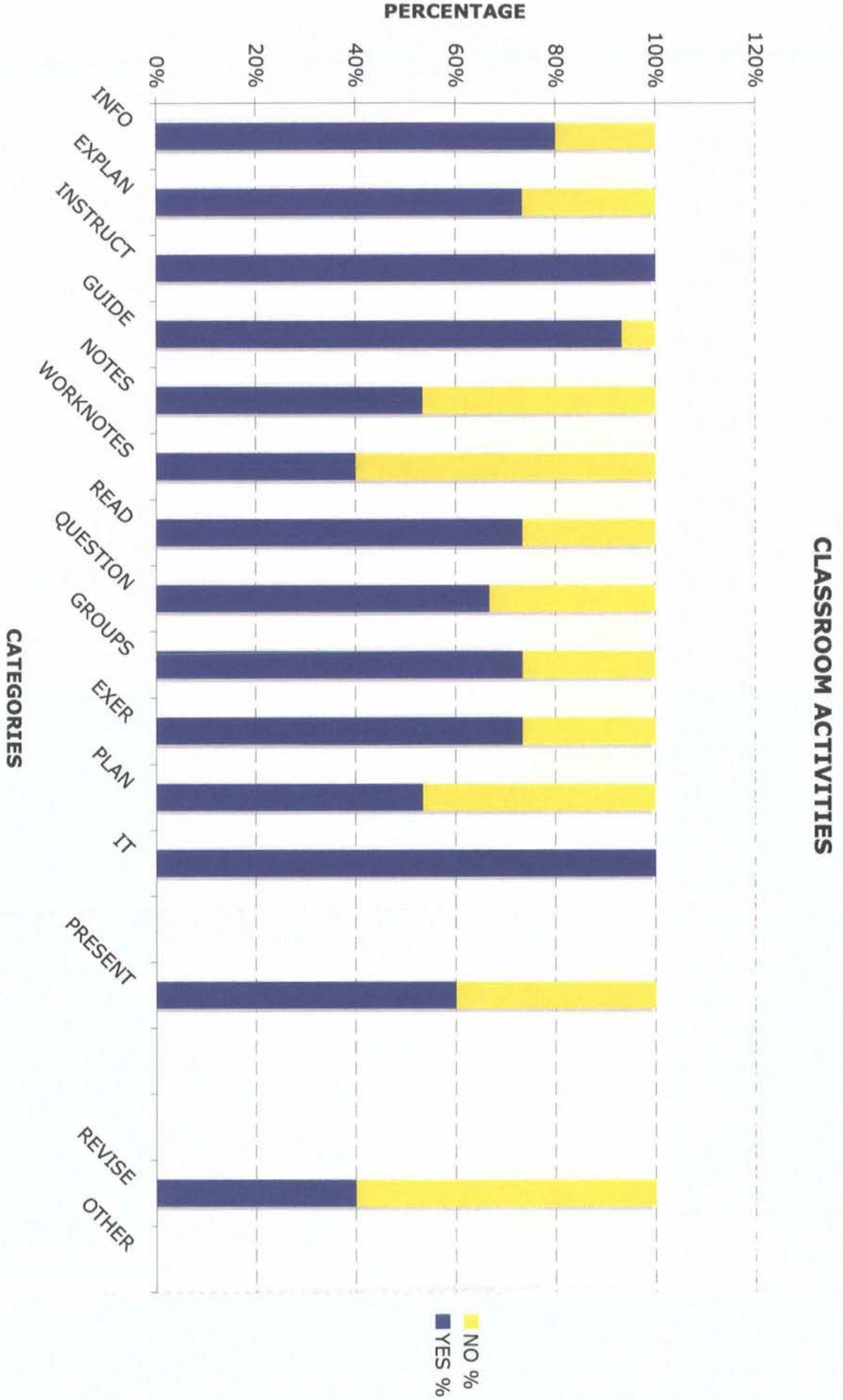


CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %


COGNITIVE OUTCOMES
PERCENTAGE
120%
100%
80%
60%
40%
20%
0%
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
CATEGORIES
NO %
YES %

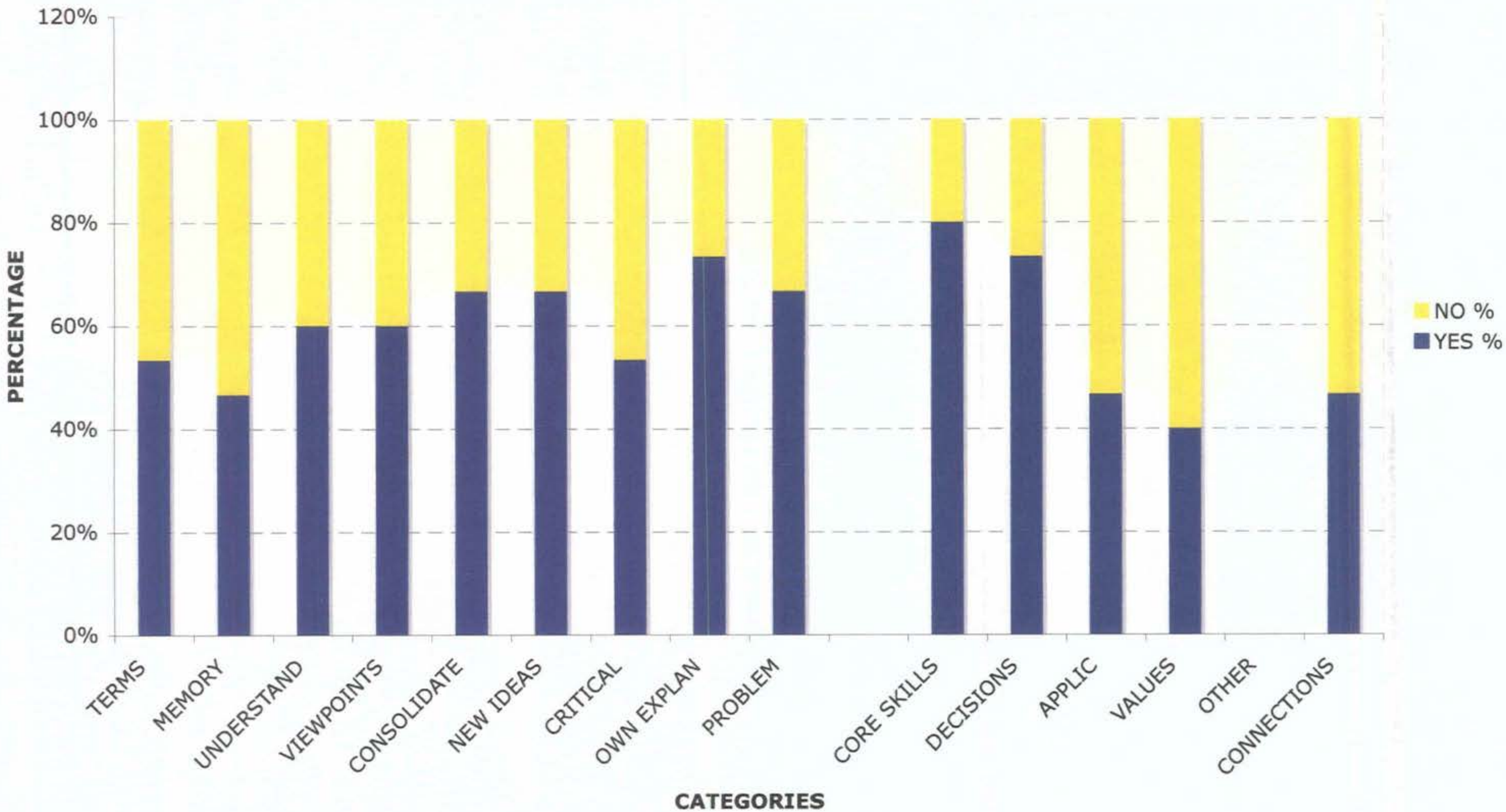
Michael Vallance's class
Week: 6
Lesson objective/s: Digital Literacy Teacher marked in grey
Networking technology used: iStorm, WWW

Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	80%	20%	12	3	TERMS	7	8	53%	47%	
EXPLAN	73%	27%	11	4	MEMORY	8	7	47%	53%	
INSTRUCT	100%	0%	15	0	UNDERSTAND	6	9	60%	40%	
GUIDE	93%	7%	14	1	VIEWPOINTS	6	9	60%	40%	
NOTES	53%	47%	8	7	CONSOLIDATE	5	10	67%	33%	
WORKNOTES	40%	60%	6	9	NEW IDEAS	5	10	67%	33%	
READ	73%	27%	11	4	CRITICAL	7	8	53%	47%	
QUESTION	67%	33%	10	5	OWN EXPLAN	4	11	73%	27%	
GROUPS	73%	27%	11	4	PROBLEM	5	10	67%	33%	
EXER	73%	27%	11	4						
PLAN	53%	47%	8	7	CORE SKILLS	3	12	80%	20%	
IT	100%	0%	15	0	DECISIONS	4	11	73%	27%	
					APPLIC	8	7	47%	53%	
PRESENT	60%	40%	9	6	VALUES	9	6	40%	60%	
					OTHER	0	0			
					CONNECTIONS	8	7	47%	53%	
REVISE	40%	60%	6	9	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences					
OTHER					activities, future roles, other subject areas					



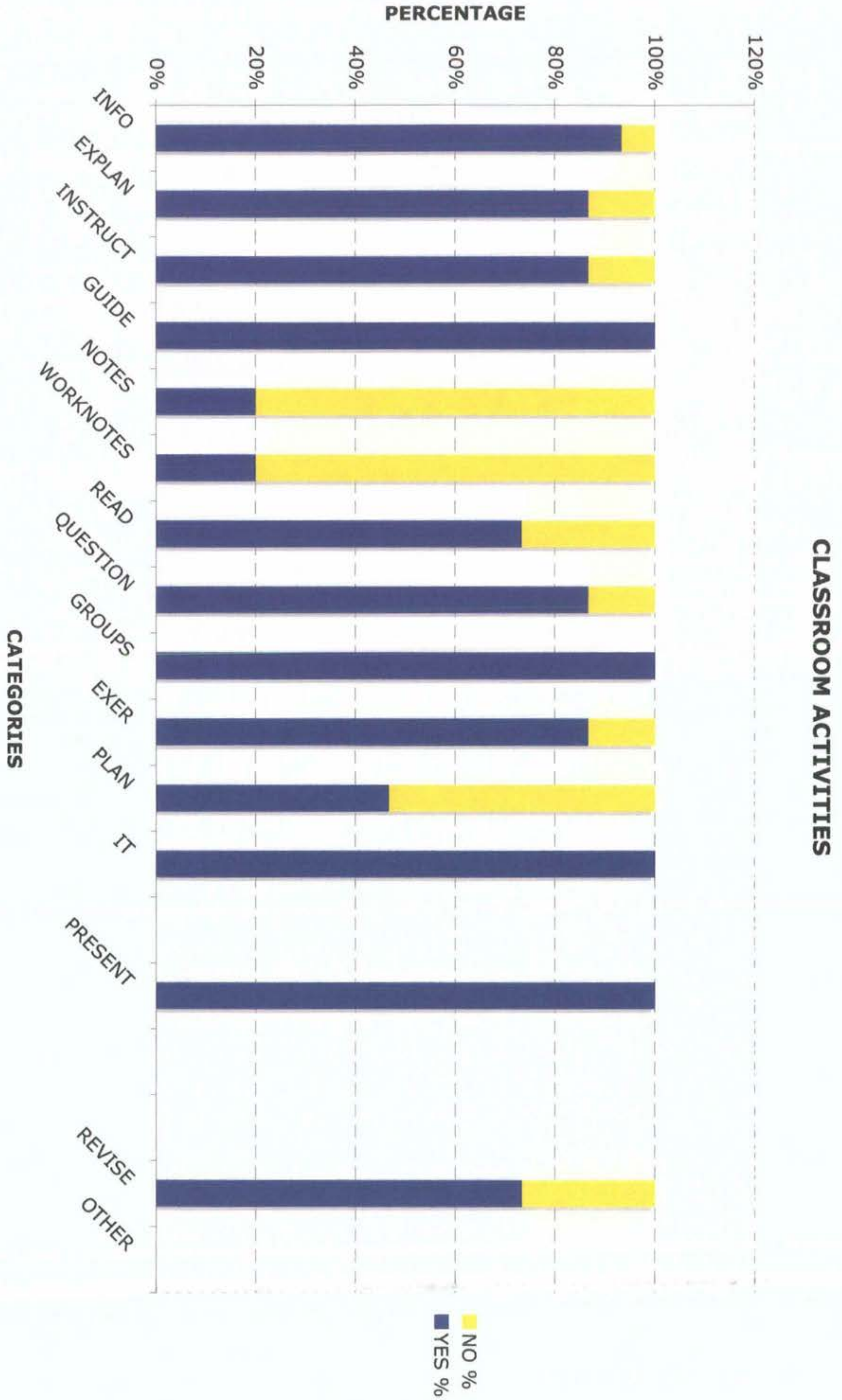
CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %

COGNITIVE OUTCOMES

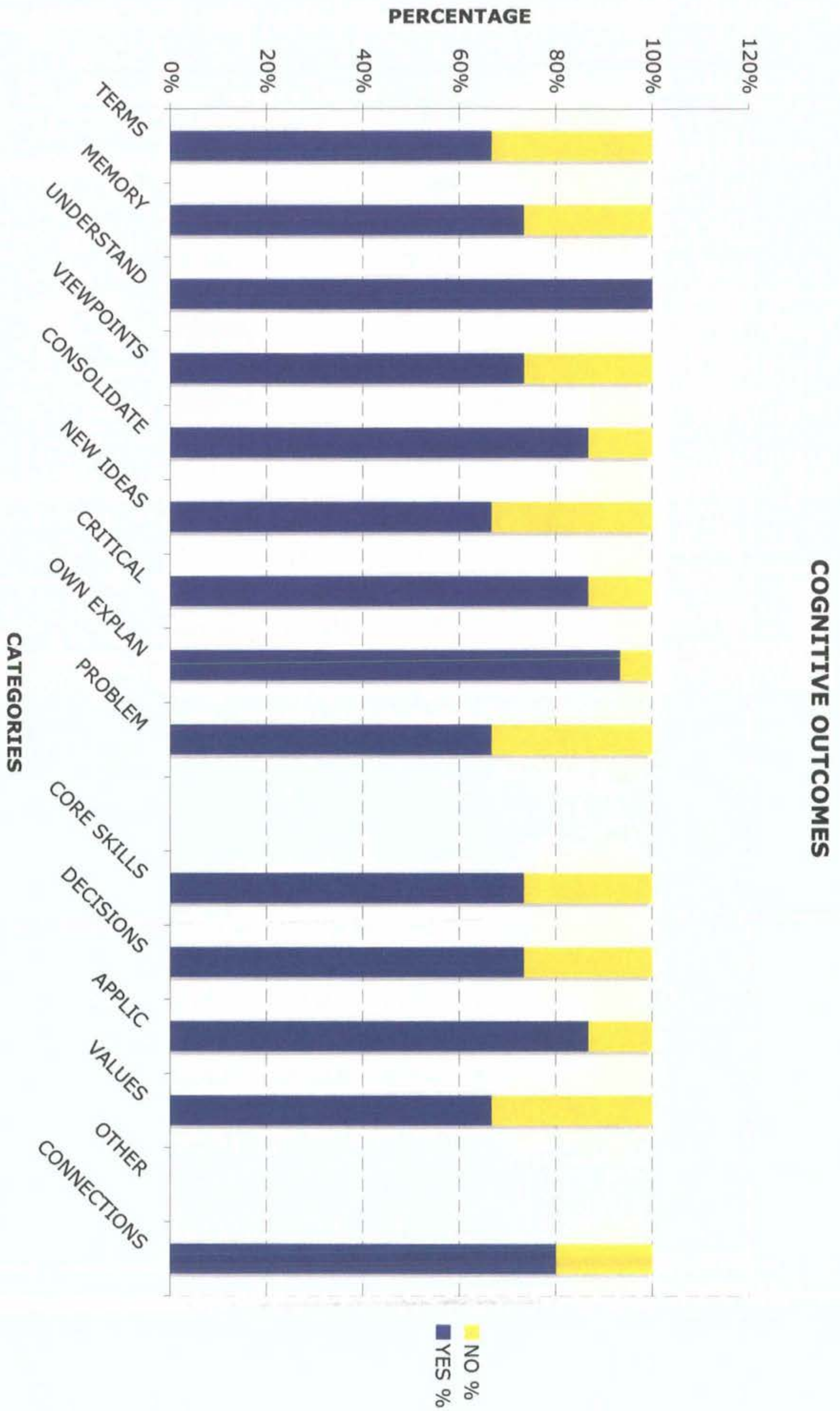


Michael Vallance's class
Week: 7
Lesson objective/s: Teachers, students and cor Teacher marked in grey
Networking technology used: Inspiration file sharing, WWW QuickTime steaming

Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	93%	7%	14	1	TERMS	5	10	67%	33%	
EXPLAN	87%	13%	13	2	MEMORY	4	11	73%	27%	
INSTRUCT	87%	13%	13	2	UNDERSTAND	0	15	100%	0%	
GUIDE	100%	0%	15	0	VIEWPOINTS	4	11	73%	27%	
NOTES	20%	80%	3	12	CONSOLIDATE	2	13	87%	13%	
WORKNOTES	20%	80%	3	12	NEW IDEAS	5	10	67%	33%	
READ	73%	27%	11	4	CRITICAL	2	13	87%	13%	
QUESTION	87%	13%	13	2	OWN EXPLAN	1	14	93%	7%	
GROUPS	100%	0%	15	0	PROBLEM	5	10	67%	33%	
EXER	87%	13%	13	2						
PLAN	47%	53%	7	8	CORE SKILLS	4	11	73%	27%	
IT	100%	0%	15	0	DECISIONS	4	11	73%	27%	
					APPLIC	2	13	87%	13%	
PRESENT	100%	0%	15	0	VALUES	5	10	67%	33%	
					OTHER	0	0			
					CONNECTIONS	3	12	80%	20%	
REVISE	73%	27%	11	4	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences					
OTHER					activities, future roles, other subject areas					

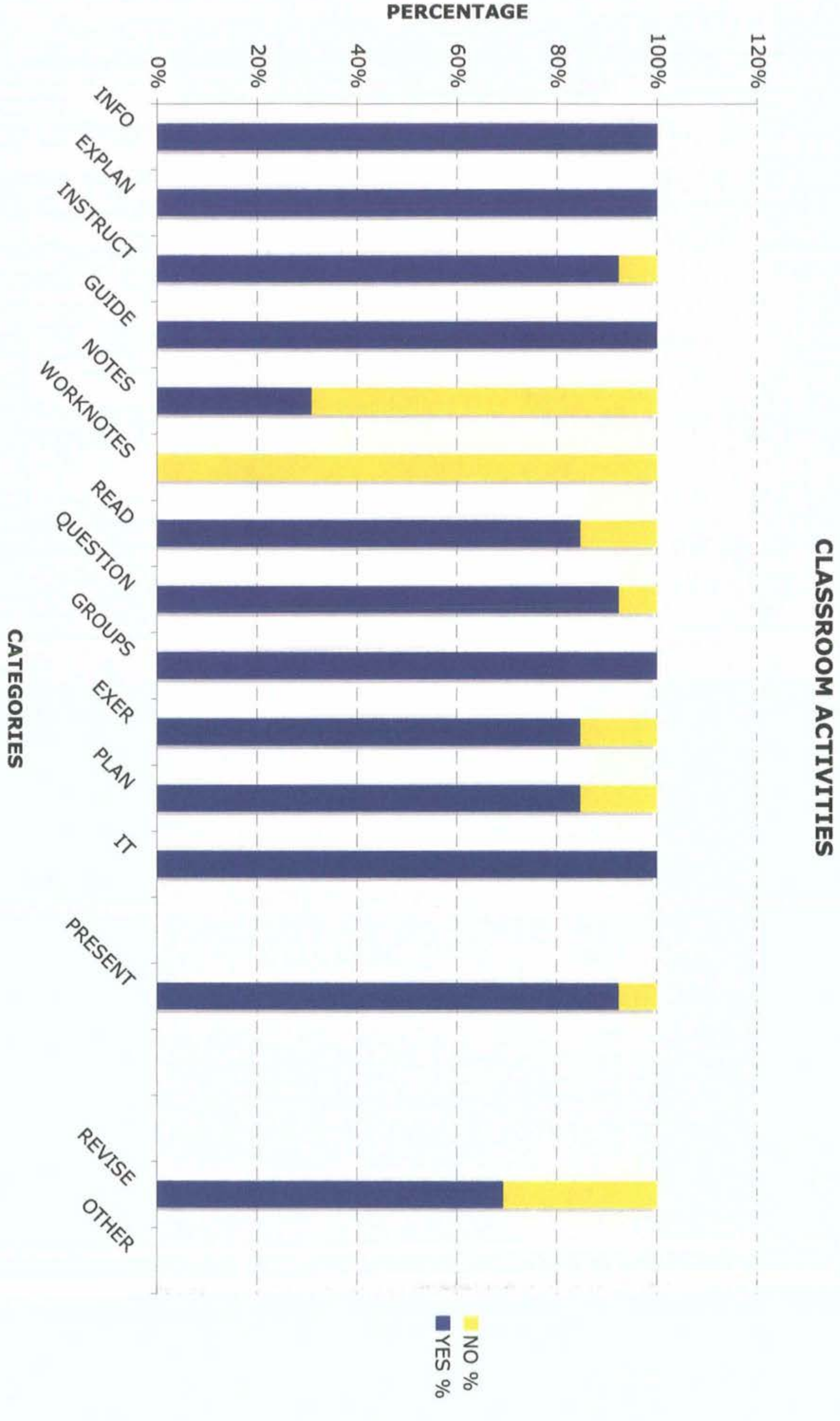


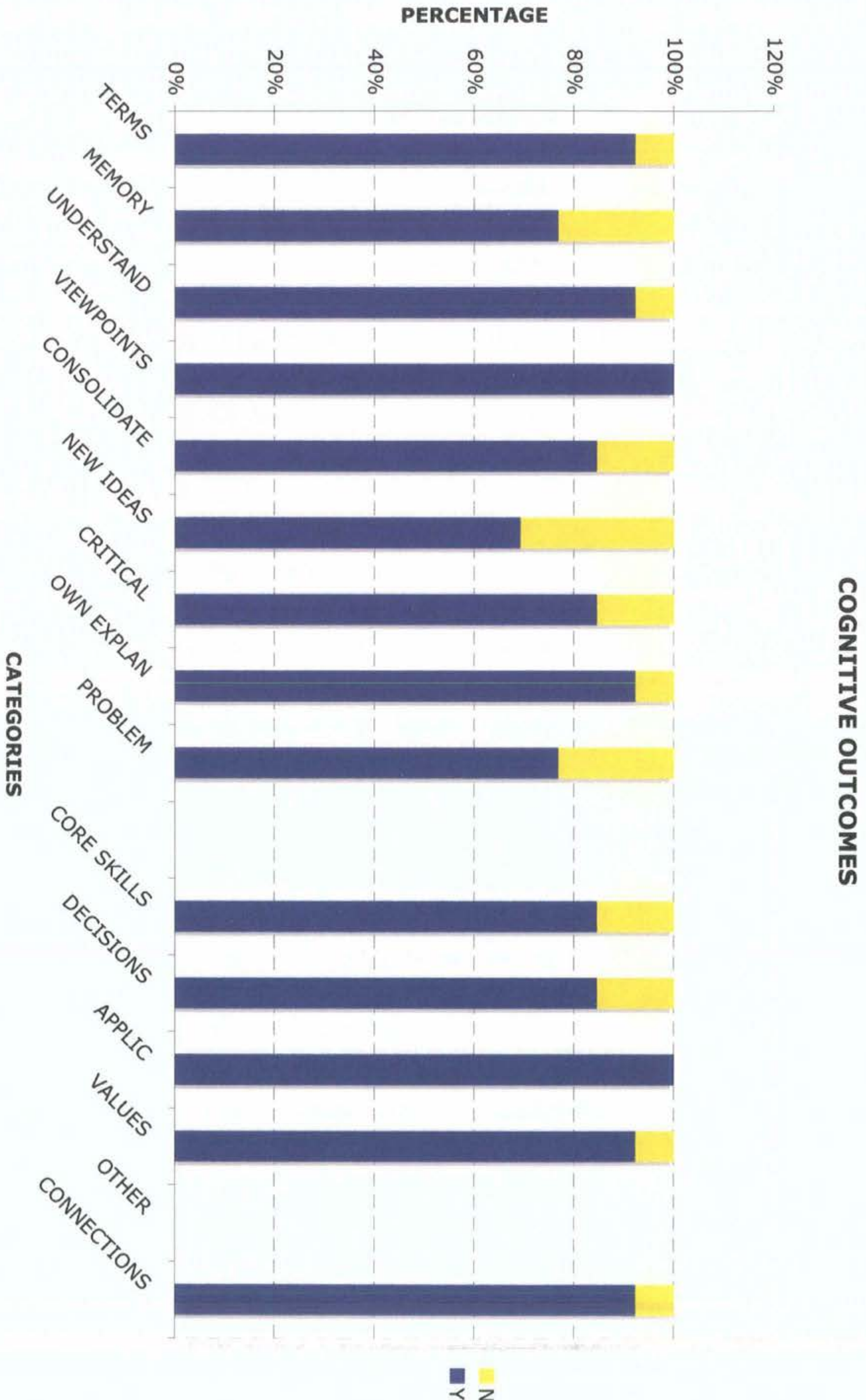
CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %


COGNITIVE OUTCOMES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
CATEGORIES
NO %
YES %

Michael Vallance's class
Week: 8
Lesson objective/s: Testing   Teacher marked in grey
Networking technology used: BBS, WWW

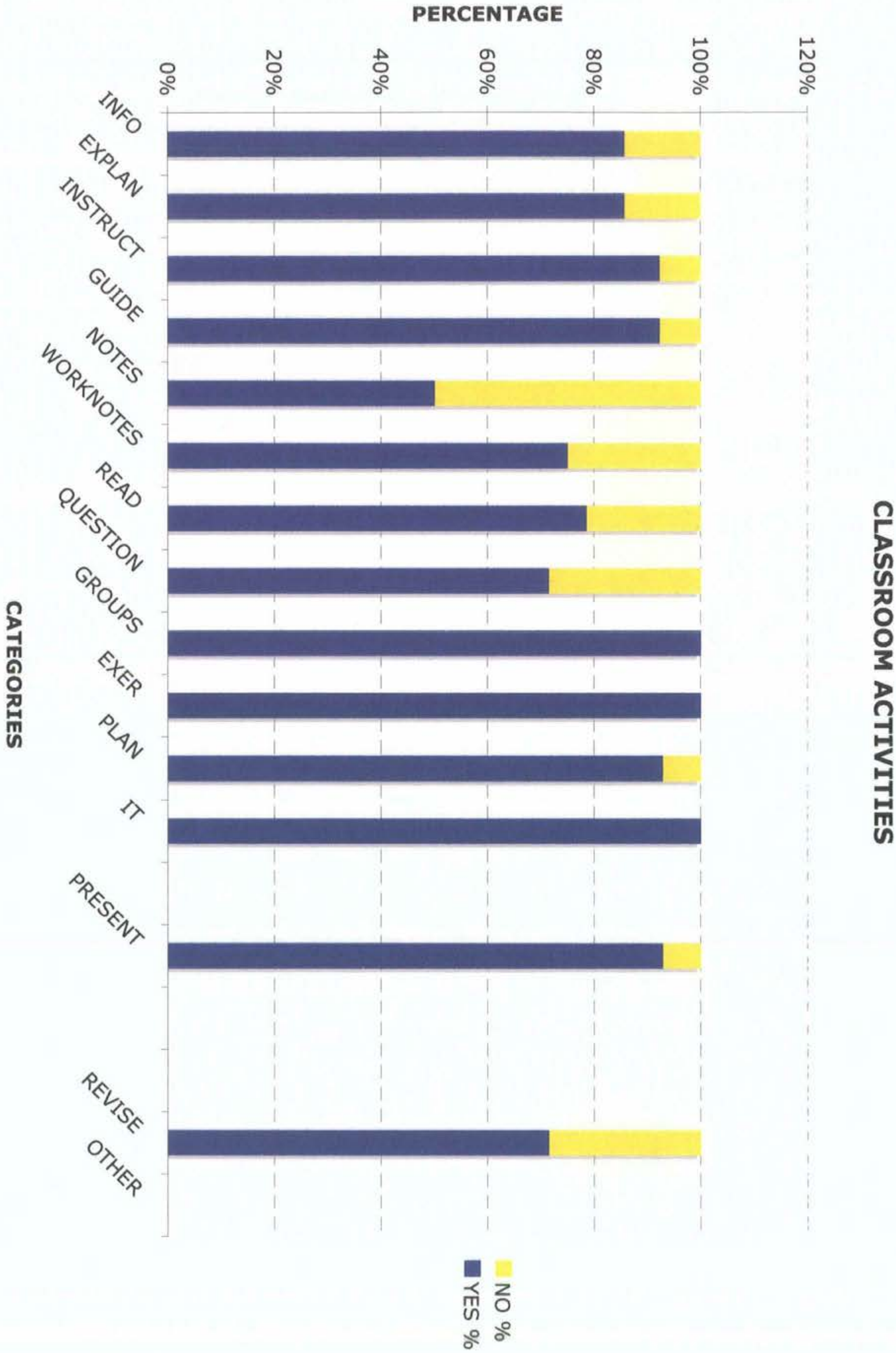
Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	100%	0%	13	0	TERMS	1	12	92%	8%	
EXPLAN	100%	0%	13	0	MEMORY	3	10	77%	23%	
INSTRUCT	92%	8%	12	1	UNDERSTAND	1	12	92%	8%	
GUIDE	100%	0%	13	0	VIEWPOINTS	0	13	100%	0%	
NOTES	31%	69%	4	9	CONSOLIDATE	2	11	85%	15%	
WORKNOTES	0%	100%	0	13	NEW IDEAS	4	9	69%	31%	
READ	85%	15%	11	2	CRITICAL	2	11	85%	15%	
QUESTION	92%	8%	12	1	OWN EXPLAN	1	12	92%	8%	
GROUPS	100%	0%	13	0	PROBLEM	3	10	77%	23%	
EXER	85%	15%	11	2						
PLAN	85%	15%	11	2	CORE SKILLS	2	11	85%	15%	
IT	100%	0%	13	0	DECISIONS	2	11	85%	15%	
					APPLIC	0	13	100%	0%	
PRESENT	92%	8%	12	1	VALUES	1	12	92%	8%	
					OTHER	0	0			
					CONNECTIONS	1	12	92%	8%	
REVISE	69%	31%	9	4	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences					
OTHER					activities, future roles, other subject areas					

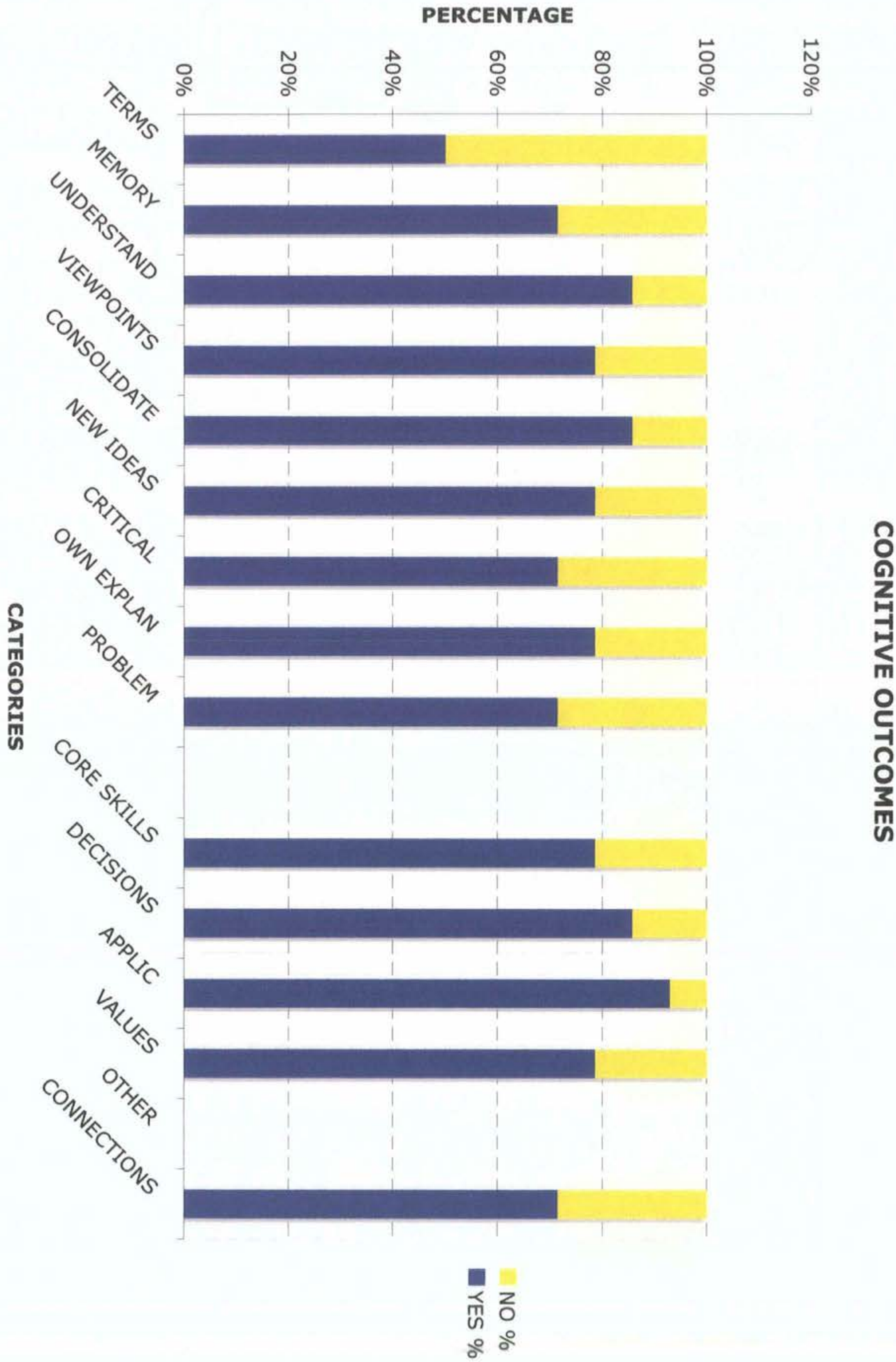

CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
CATEGORIES
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
NO %
YES %


COGNITIVE OUTCOMES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
CATEGORIES
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
NO %
YES %

Michael Vallance's class
Week: 9
Lesson objective/s: Young Learners — Teacher marked in grey
Networking technology used: iStorm

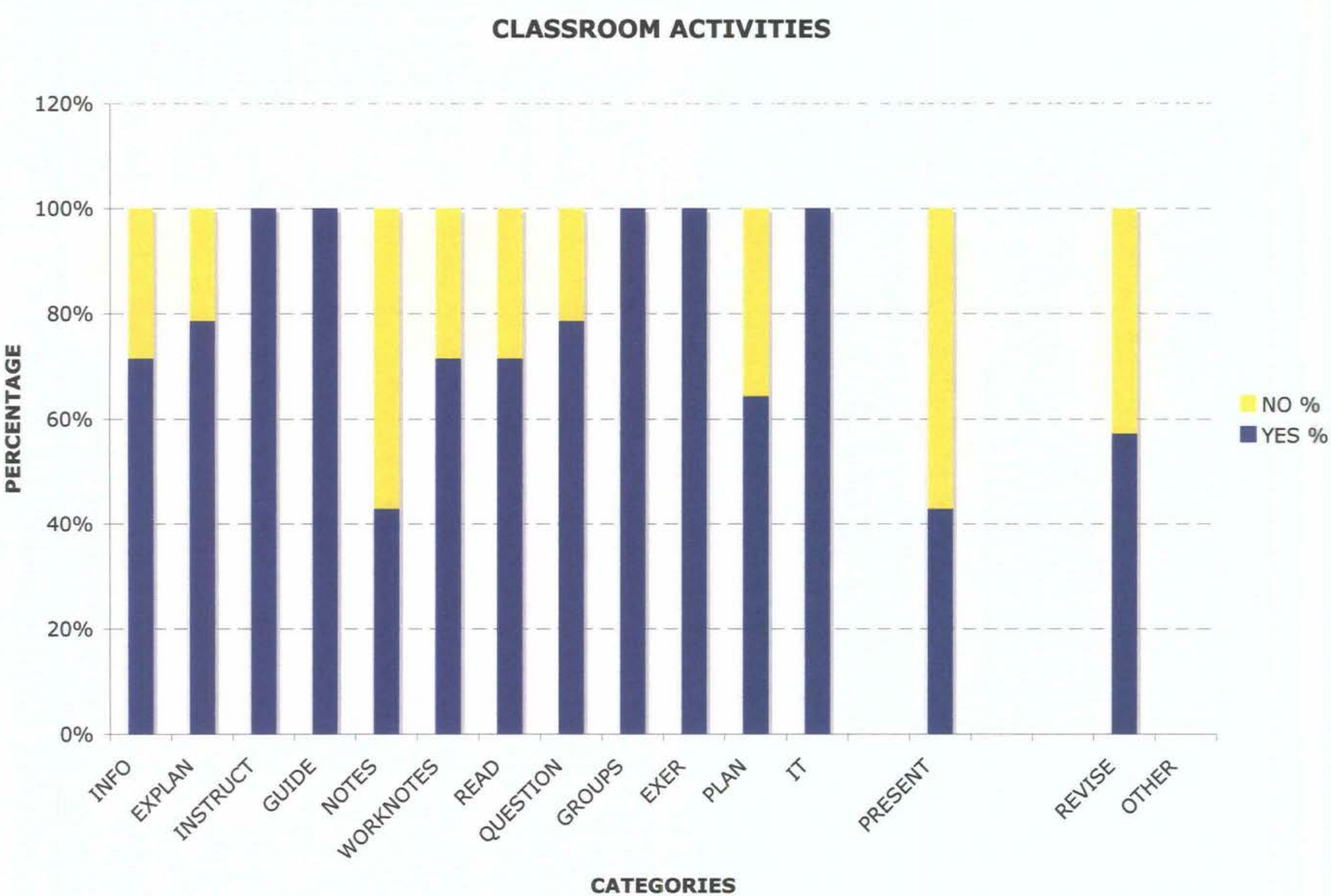
Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	86%	14%	12	2	TERMS	7	7	50%	50%	
EXPLAN	86%	14%	12	2	MEMORY	4	10	71%	29%	
INSTRUCT	92%	8%	12	1	UNDERSTAND	2	12	86%	14%	
GUIDE	92%	8%	12	1	VIEWPOINTS	3	11	79%	21%	
NOTES	50%	50%	7	7	CONSOLIDATE	2	12	86%	14%	
WORKNOTES	75%	25%	9	3	NEW IDEAS	3	11	79%	21%	
READ	79%	21%	11	3	CRITICAL	4	10	71%	29%	
QUESTION	71%	29%	10	4	OWN EXPLAN	3	11	79%	21%	
GROUPS	100%	0%	14	0	PROBLEM	4	10	71%	29%	
EXER	100%	0%	14	0						
PLAN	93%	7%	13	1	CORE SKILLS	3	11	79%	21%	
IT	100%	0%	14	0	DECISIONS	2	12	86%	14%	
					APPLIC	1	13	93%	7%	
PRESENT	93%	7%	13	1	VALUES	3	11	79%	21%	
					OTHER	0	0			
			7	7	CONNECTIONS	4	10	71%	29%	
REVISE	71%	29%	10	4	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences activities, future roles, other subject areas					
OTHER										


CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %

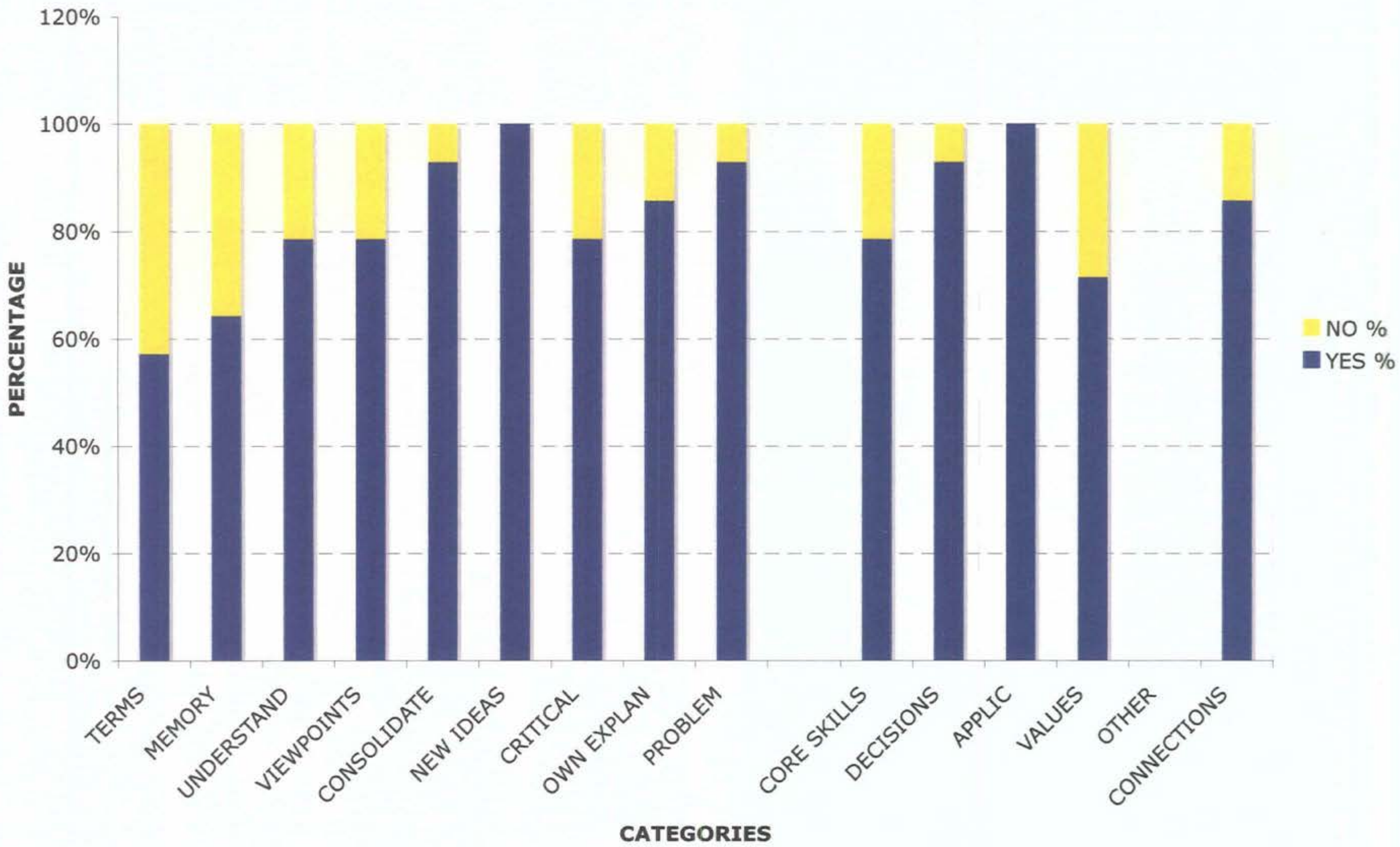

COGNITIVE OUTCOMES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
CATEGORIES
NO %
YES %

Michael Vallance's class
Week: 10
Lesson objective/s: Young Learners Teacher marked in grey
Networking technology used: iStorm

Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	71%	29%	10	4	TERMS	6	8	57%	43%	
EXPLAN	79%	21%	11	3	MEMORY	5	9	64%	36%	
INSTRUCT	100%	0%	14	0	UNDERSTAND	3	11	79%	21%	
GUIDE	100%	0%	14	0	VIEWPOINTS	3	11	79%	21%	
NOTES	43%	57%	6	8	CONSOLIDATE	1	13	93%	7%	
WORKNOTES	71%	29%	10	4	NEW IDEAS	0	14	100%	0%	
READ	71%	29%	10	4	CRITICAL	3	11	79%	21%	
QUESTION	79%	21%	11	3	OWN EXPLAN	2	12	86%	14%	
GROUPS	100%	0%	14	0	PROBLEM	1	13	93%	7%	
EXER	100%	0%	14	0						
PLAN	64%	36%	9	5	CORE SKILLS	3	11	79%	21%	
IT	100%	0%	14	0	DECISIONS	1	13	93%	7%	
					APPLIC	0	14	100%	0%	
PRESENT	43%	57%	6	8	VALUES	4	10	71%	29%	
					OTHER	0	0			
					CONNECTIONS	2	12	86%	14%	
REVISE	57%	43%	8	6	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences activities, future roles, other subject areas					
OTHER										

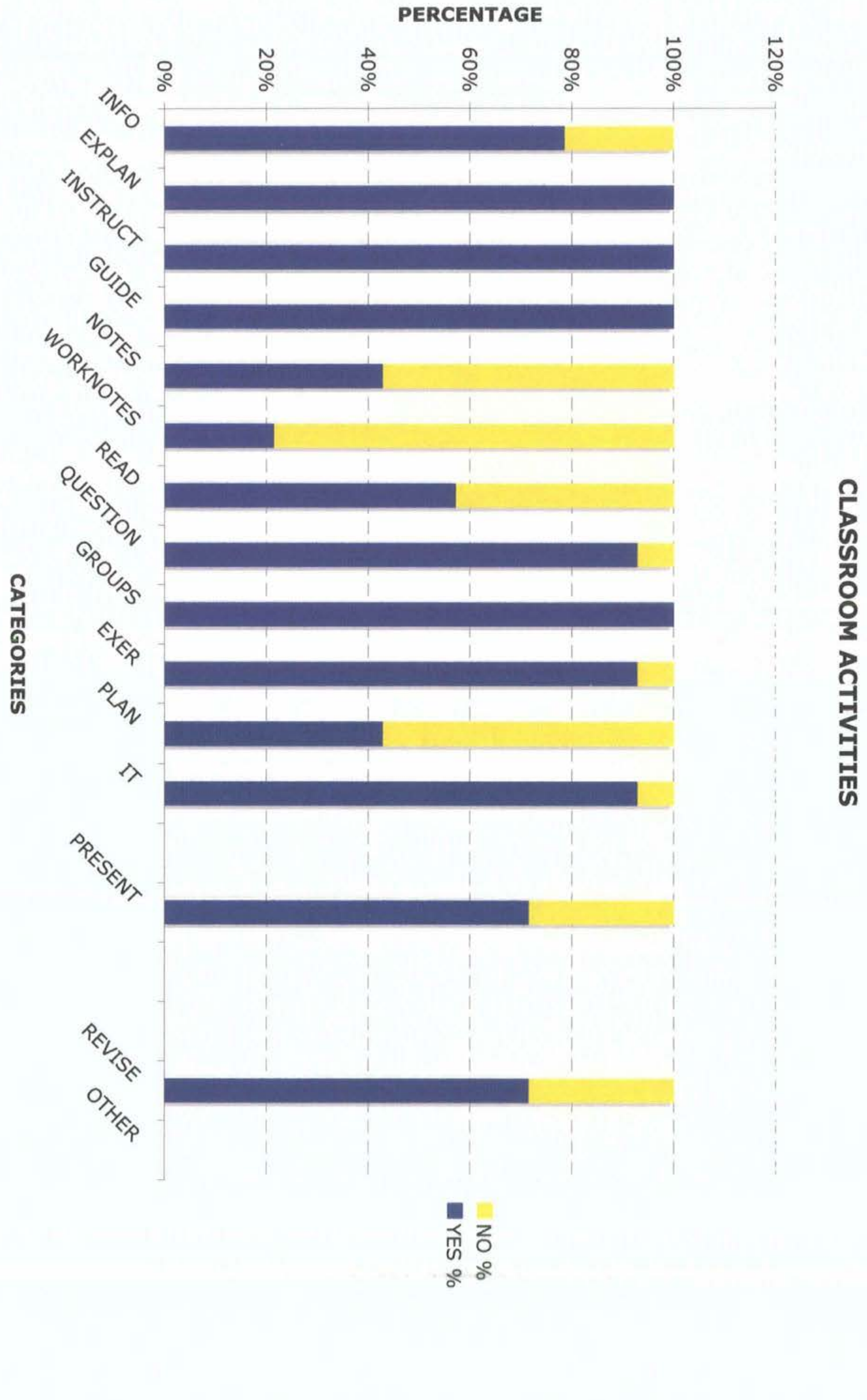

CLASSROOM ACTIVITIES
PERCENTAGE
120%
100%
80%
60%
40%
20%
0%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %

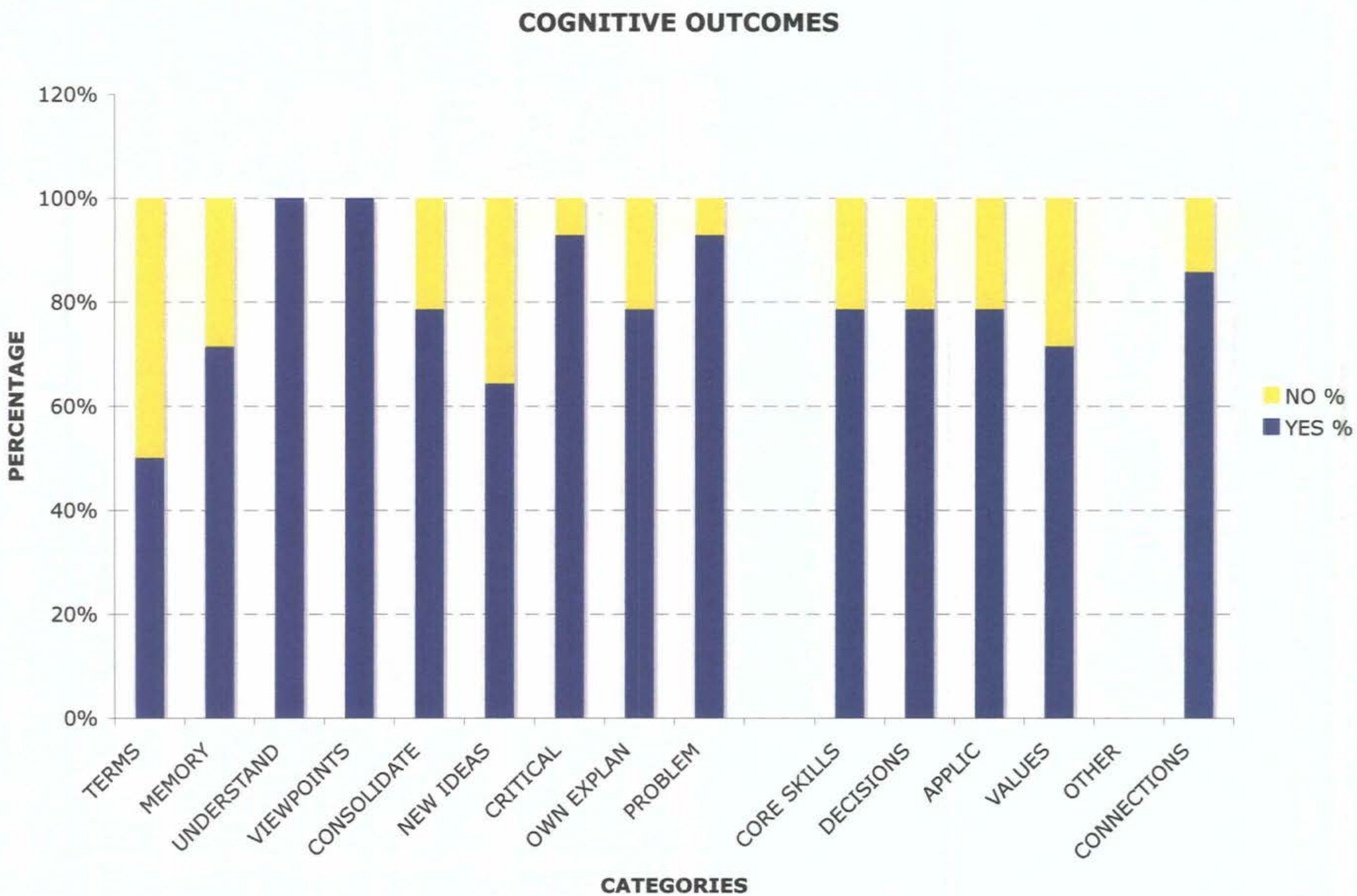
COGNITIVE OUTCOMES



Michael Vallance's class
Week: 11
Lesson objective/s: Consolidation Teacher marked in grey
Networking technology used: BBS File sharing Inspiration

Classroom activity categories	Yes/ No		Yes/No		Intended cognitive outcomes	0 1 2 3 4 5				
	Whether		Whether			Extent to which they took place- 0-1-2 / 3-4-5 have been accumulated				
	YES %	NO %	YES	NO		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	79%	21%	11	3	TERMS	7	7	50%	50%	
EXPLAN	100%	0%	14	0	MEMORY	4	10	71%	29%	
INSTRUCT	100%	0%	14	0	UNDERSTAND	0	14	100%	0%	
GUIDE	100%	0%	14	0	VIEWPOINTS	0	14	100%	0%	
NOTES	43%	57%	6	8	CONSOLIDATE	3	11	79%	21%	
WORKNOTES	21%	79%	3	11	NEW IDEAS	5	9	64%	36%	
READ	57%	43%	8	6	CRITICAL	1	13	93%	7%	
QUESTION	93%	7%	13	1	OWN EXPLAN	3	11	79%	21%	
GROUPS	100%	0%	14	0	PROBLEM	1	13	93%	7%	
EXER	93%	7%	13	1						
PLAN	43%	57%	6	8	CORE SKILLS	3	11	79%	21%	
IT	93%	7%	13	1	DECISIONS	3	11	79%	21%	
					APPLIC	3	11	79%	21%	
PRESENT	71%	29%	10	4	VALUES	4	10	71%	29%	
					OTHER	0	0			
					CONNECTIONS	2	12	86%	14%	
REVISE	71%	29%	10	4	Connections refer to whether you explicitly connected the learning to any other area of the students' experiences activities, future roles, other subject areas					
OTHER										


CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
NO %
YES %


COGNITIVE OUTCOMES
PERCENTAGE
120%
100%
80%
60%
40%
20%
0%
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
CATEGORIES
NO %
YES %

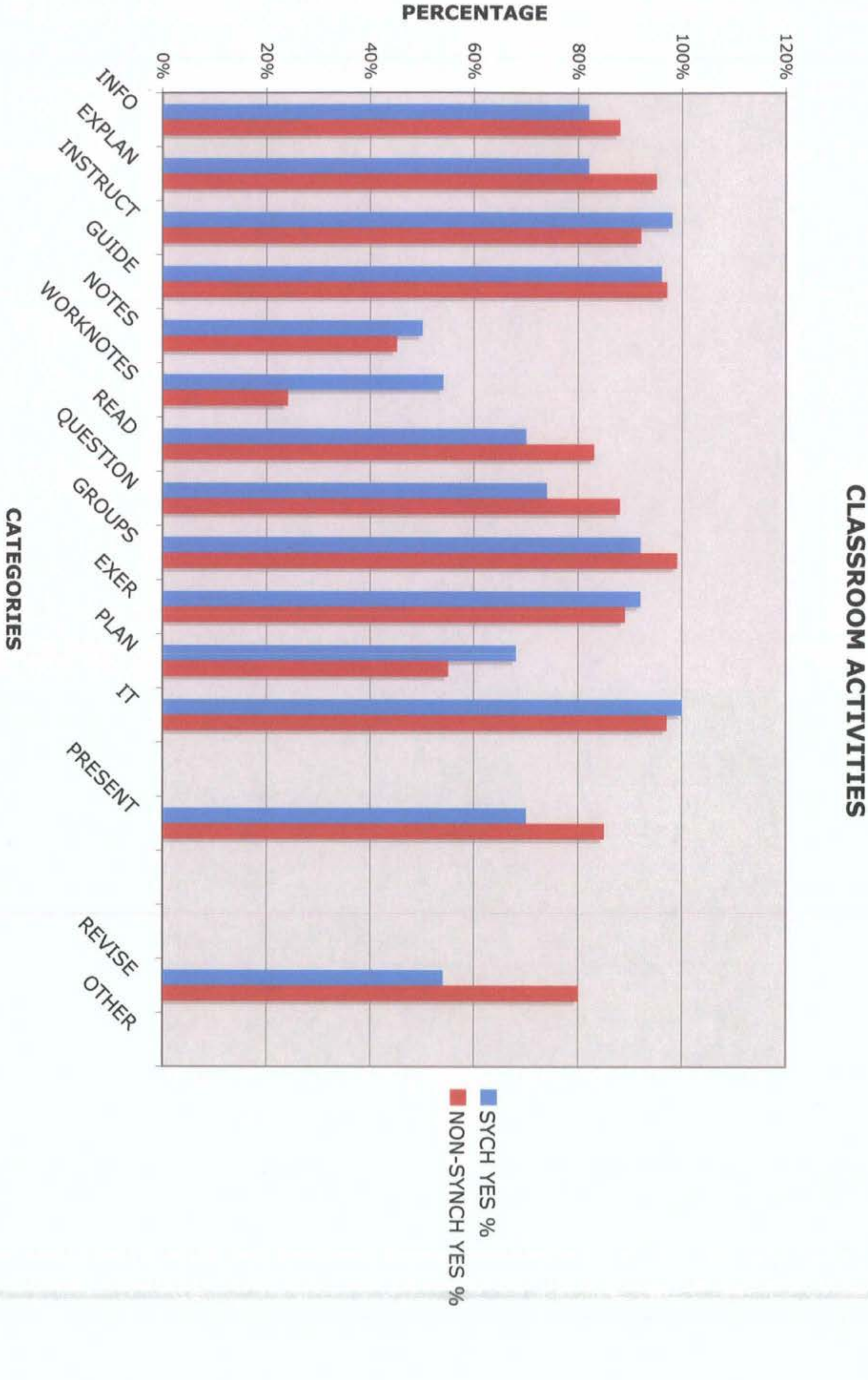
Appendix 3
Quantitative data – synchronous (SYNCH) and non-synchronous (NO SYNCH) collated.

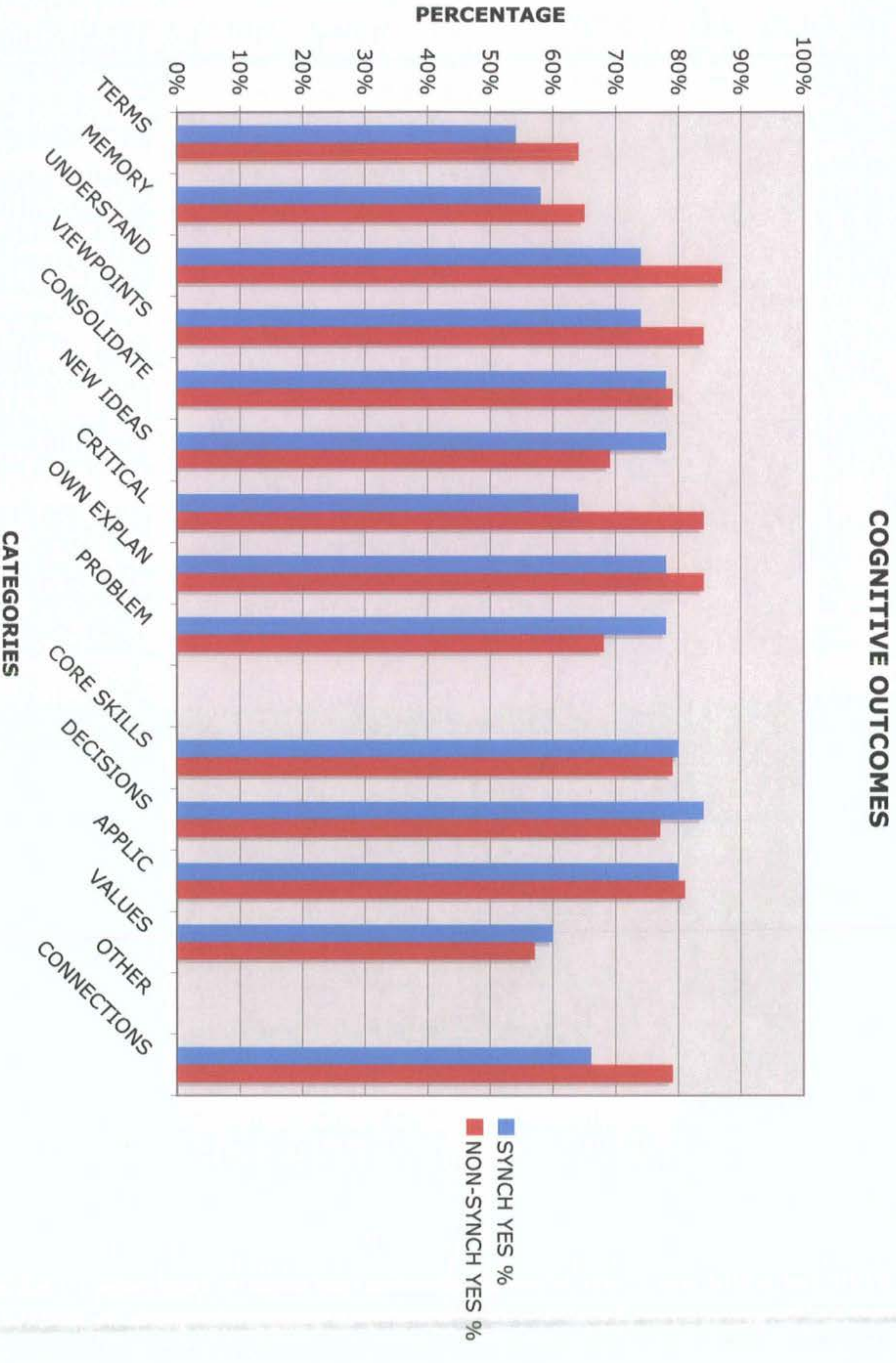
CLASSROOM ACTIVITIES

	SYCH	SYNCH	NON-SYNCH	NON-SYNCH
	YES %	NO %	YES %	NO %
INFO	82%	18%	88%	12%
EXPLAN	82%	18%	95%	5%
INSTRUCT	98%	2%	92%	8%
GUIDE	96%	4%	97%	3%
NOTES	50%	50%	45%	55%
WORKNOTES	54%	46%	24%	76%
READ	70%	30%	83%	17%
QUESTION	74%	26%	88%	12%
GROUPS	92%	8%	99%	1%
EXER	92%	8%	89%	11%
PLAN	68%	32%	55%	45%
IT	100%	0%	97%	3%
PRESENT	70%	30%	85%	15%
REVISE	54%	46%	80%	20%
OTHER				

COGNITIVE OUTCOMES

	SYNCH	SYNCH	NON-SYNCH	NON-SYNCH
	YES %	NO %	YES %	NO %
TERMS	54%	46%	64%	36%
MEMORY	58%	42%	65%	35%
UNDERSTAND	74%	26%	87%	13%
VIEWPOINTS	74%	26%	84%	16%
CONSOLIDATE	78%	22%	79%	21%
NEW IDEAS	78%	22%	69%	31%
CRITICAL	64%	36%	84%	16%
OWN EXPLAN	78%	22%	84%	16%
PROBLEM	78%	22%	68%	32%
CORE SKILLS	80%	20%	79%	21%
DECISIONS	84%	16%	77%	23%
APPLIC	80%	20%	81%	19%
VALUES	60%	40%	57%	43%
OTHER				
CONNECTIONS	66%	34%	79%	21%


CLASSROOM ACTIVITIES
PERCENTAGE
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
CATEGORIES
SYCH YES %
NON-SYNCH YES %

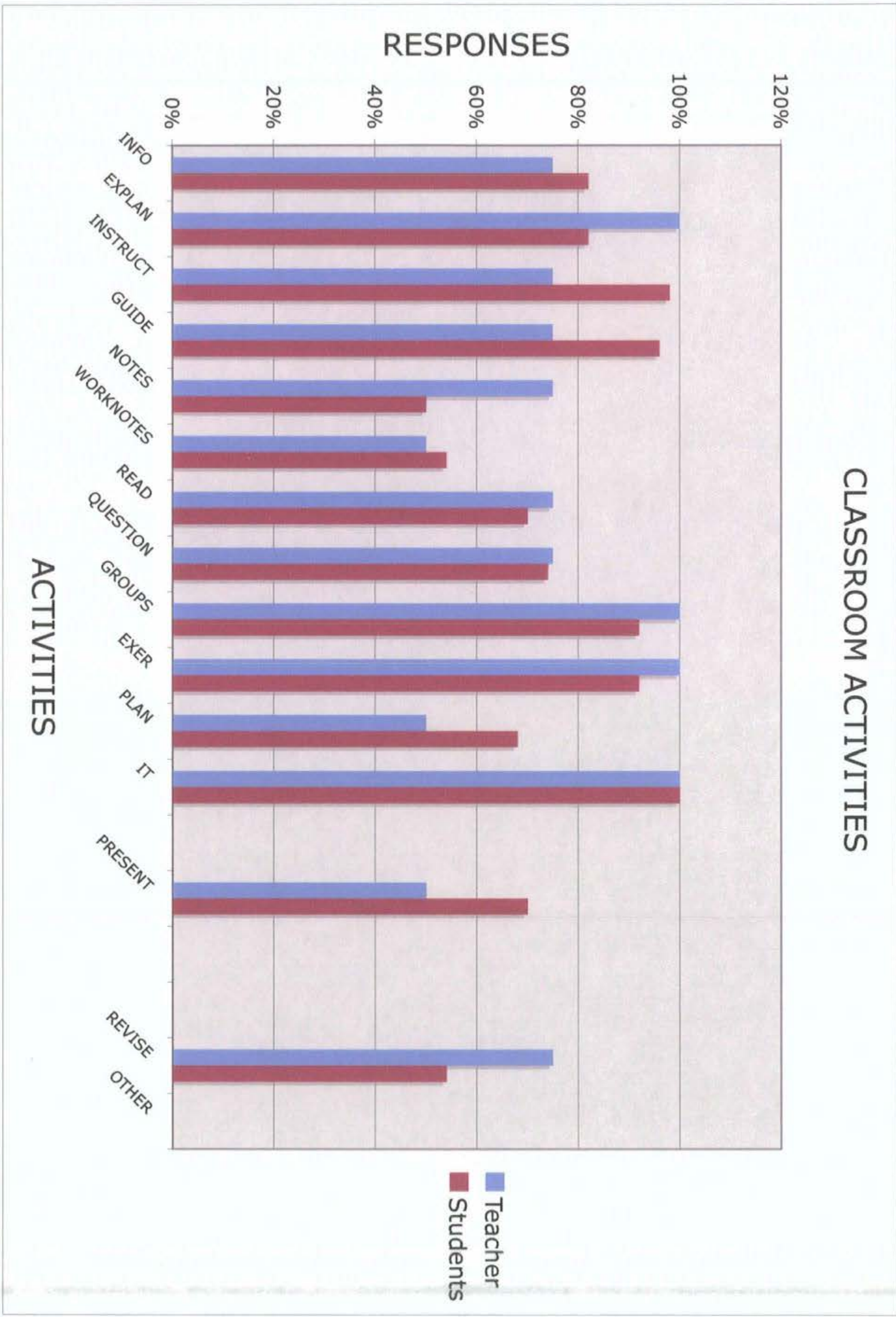

COGNITIVE OUTCOMES
PERCENTAGE
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
CATEGORIES
SYNCH YES %
NON-SYNCH YES %

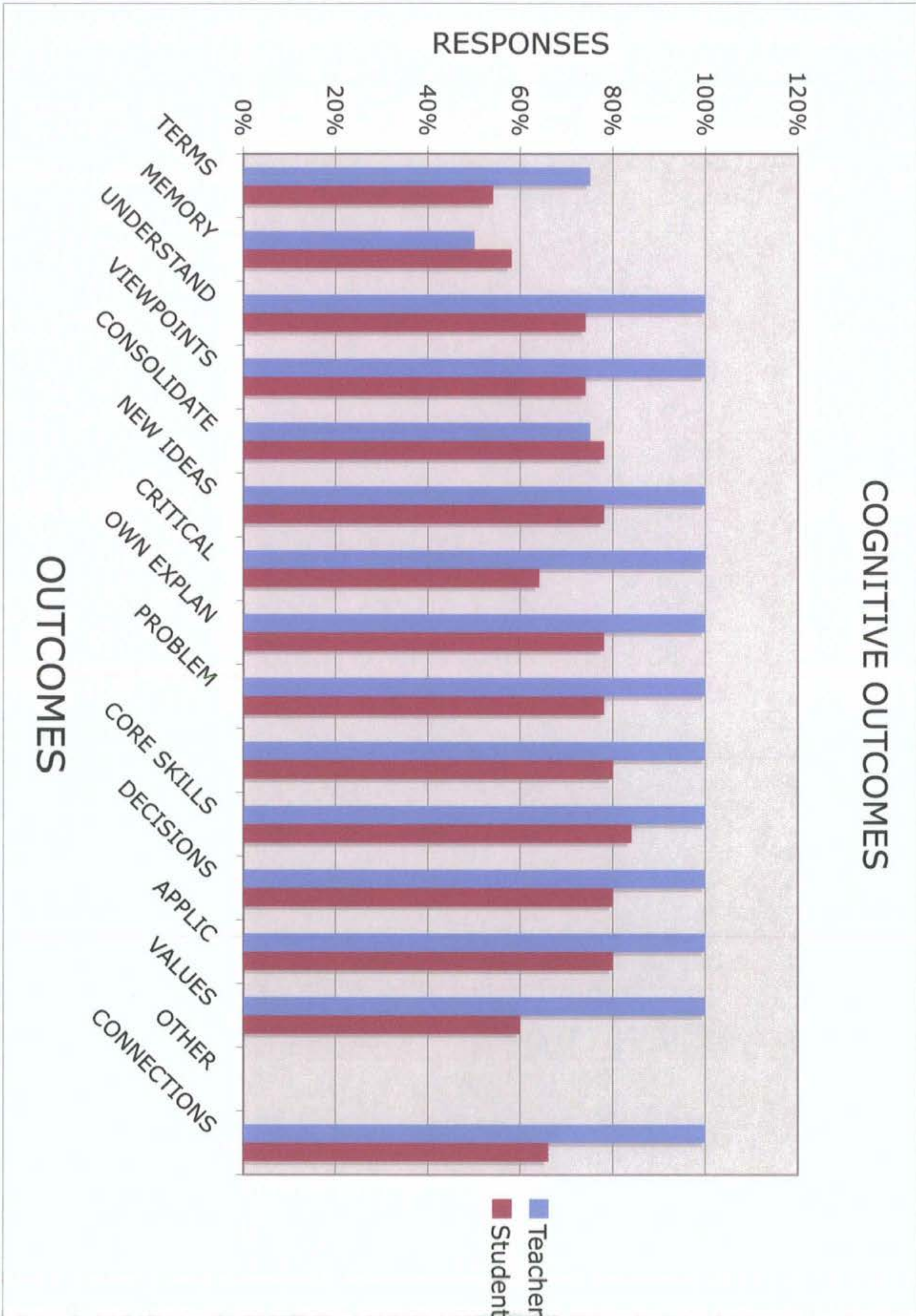
Appendix 4

Quantitative data – synchronous (SYNCH) teacher and students' data collated.

TEACHER V STUDENTS - COLLATED DATA

Michael Vallance's class														
Week:														
Lesson objective/s:														
Networking technology use							SYNCH - TEACHERS COLLATED / STUDENTS CO							
	Teacher / classroom activities		Student/ classroom activity categoriesYes/ No		Yes/No		Teacher/ Intended cognitive outcomes		Student/Intended cognitive outcomes				0 1 2 3 4 5	
			Whether		Whether activity took					Extent to which they took place- 0-1-2 / 3-4-5 have been accun				
	YES %	NO %	YES %	NO %	YES	NO	YES %	NO %		0/1/2 = NO	3/4/5 = YES	YES %	NO %	
INFO	75%	25%	82%	18%	41	9	75	25	TERMS	23	27	54%	46%	
EXPLAN	100%	0%	82%	18%	41	9	50	50	MEMORY	21	29	58%	42%	
INSTRUCT	75%	25%	98%	2%	49	1	100	0	UNDERSTAND	13	37	74%	26%	
GUIDE	75%	25%	96%	4%	48	2	100	0	VIEWPOINTS	13	37	74%	26%	
NOTES	75%	25%	50%	50%	25	25	75	25	CONSOLIDATE	11	39	78%	22%	
WORKNOTES	50.0%	50.0%	54%	46%	27	23	100	0	NEW IDEAS	11	39	78%	22%	
READ	75%	25%	70%	30%	35	15	100	0	CRITICAL	18	32	64%	36%	
QUESTION	75%	25%	74%	26%	37	13	100	0	OWN EXPLAN	11	39	78%	22%	
GROUPS	100%	0%	92%	8%	46	4	100	0	PROBLEM	11	39	78%	22%	
EXER	100%	0%	92%	8%	46	4	100	0						
PLAN	50.0%	50.0%	68%	32%	34	16	100	0	CORE SKILLS	10	40	80%	20%	
IT	100%	0%	100%	0%	50	0	100	0	DECISIONS	8	42	84%	16%	
							100	0	APPLIC	10	40	80%	20%	
PRESENT	50.0%	50.0%	70%	30%	35	15	100	0	VALUES	20	30	60%	40%	
									OTHER					
							100	0	CONNECTIONS	17	33	66%	34%	
REVISE	75%	25%	54%	46%	27	23			Connections refer to whether you explicitly connected the learning to any other a					


CLASSROOM ACTIVITIES
RESPONSES
0%
20%
40%
60%
80%
100%
120%
INFO
EXPLAN
INSTRUCT
GUIDE
NOTES
WORKNOTES
READ
QUESTION
GROUPS
EXER
PLAN
IT
PRESENT
REVISE
OTHER
ACTIVITIES
Teacher
Students


COGNITIVE OUTCOMES
RESPONSES
0%
20%
40%
60%
80%
100%
120%
TERMS
MEMORY
UNDERSTAND
VIEWPOINTS
CONSOLIDATE
NEW IDEAS
CRITICAL
OWN EXPLAN
PROBLEM
CORE SKILLS
DECISIONS
APPLIC
VALUES
OTHER
CONNECTIONS
OUTCOMES
Teacher
Students

Appendix 5
Calculation for Breadth of Learning.

A. ACTIVITIES

The total number of ACTIVITIES categories = 14

The total number of surveys collected = 125

For each ACTIVITY the total number of YES and total number of NO were collated,

for example, INFO: YES = 41; NO = 9

Thus, the TOTAL number of YES = 541

And, the TOTAL number of NO = 159

The MEAN = [541/(541+159)] x 14 = 0.77 x 14 = 10.8

Therefore, MEAN number of ACTIVITIES = 11

B. COGNITIVE OUTCOMES

The above procedure was repeated for the COGNITIVE OUTCOMES.

The total number of COGNITIVE OUTCOMES categories = 14

The MEAN = [503/(503+197)] x 14 = 0.72 x 14 = 10.1

Therefore, MEAN number of COGNITIVE OUTCOMES = 10

C. BREADTH OF LEARNING

On the BREADTH OF LEARNING graph, the x-axes represents the COGNITIVE OUTCOMES while the y-axes represents ACTIVITIES.

The mean values (above) were then intersected thereby presenting four (4) quadrants on the graph.

Each quadrant represents BREADTH OF LEARNING as,

High COGNITIVE OUTCOMES: High ACTIVITIES

High COGNITIVE OUTCOMES: Low ACTIVITIES

Low COGNITIVE OUTCOMES: High ACTIVITIES

Low COGNITIVE OUTCOMES: Low ACTIVITIES

Each of the 125 surveys were then read again. If a survey had 10 or more COGNITIVE OUTCOMES tagged YES then this was considered as High COGNITIVE OUTCOMES.

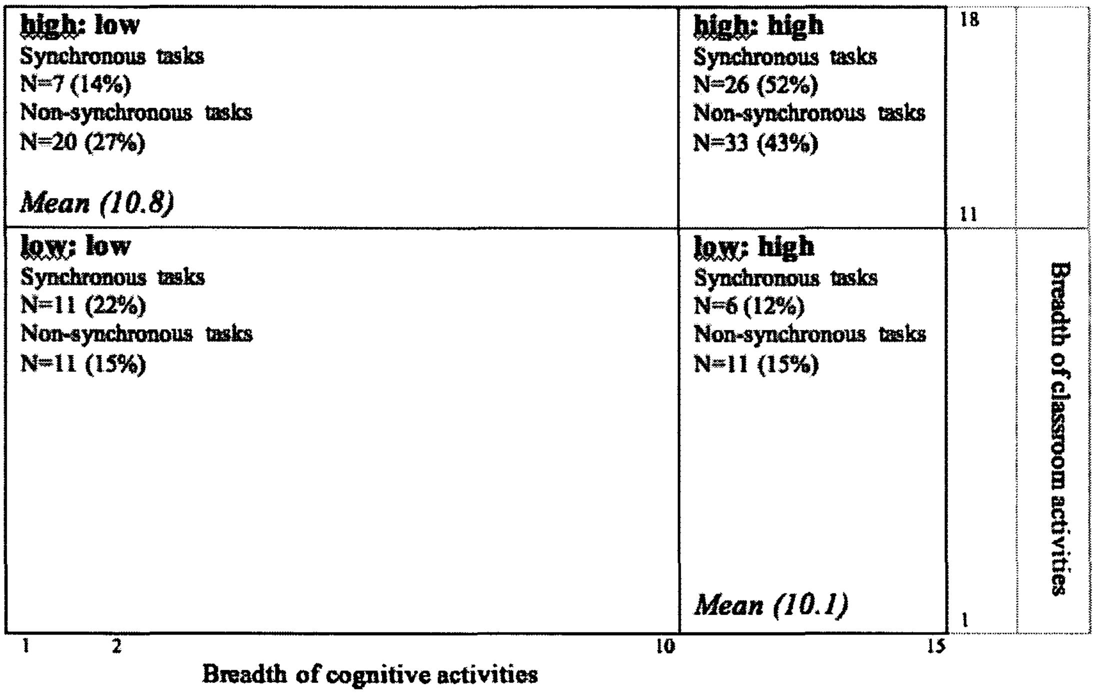
If a survey had 11 or more ACTIVITIES tagged YES then this was considered as a High ACTIVITIES.

Therefore, this particular survey was included in the High:High quadrant.

Each SYNCH survey and each NONSYNCH survey were then accessed and categorised into one of the four quadrants.

SYNCH totals and NONSYNCH totals for each quadrant was then represented as percentages due to the different number of lessons (SYNCH = 4, NONSYNCH = 7).

The following BREADTH OF LEARNING graph was thus developed.



Appendix 6

Transcripts of synchronous (SYNCH) tasks – a sample transcript.

{QTtext}{timeScale:30}

[00:00:00.00]
A= Zura
B= Lakshmi
C= Hui Min
GROUP HOODLANDS

[00:00:15.00]
C: you are talking in literal terms right? they won't be able to see between two human beings
[00:00:23.00]
C: they'll see it like..
[00:00:25.00]
C: so how do you move it to the next level?
[00:00:27.00]
C: oh oh our turn
B: just cut and put this first
[00:00:54.00]
C: filial piety. oh they also have
[00:01:00.00]
C: stealing the ideas of .. literal sense
A: just put literal sense
[00:01:08.00]
C: put already
B: so pass it ah
[00:01:31.00]
A: go to the text edit and we continue
[00:01:40.00]
C: literal
A: figurative ah
[00:01:43.00]
C: figurative ah, not literal
[00:01:50.00]
C: figurative. examples?
B: local examples
[00:02:05.00]
C: i help you with a bank loan and then you run away
[00:02:15.00]
A: do we have to make that relevant to their experience?
[00:02:20.00]
C: yeah
A: get it smaller scale first
[00:02:23.00]
C: yeah you friend lends you some money then you don't want don't want
[00:02:33.00]
C: they lend you a phone then you steal it
A: oh yeah
[00:02:37.00]
B: we need to make a call. what am i talking about?
A: they need to make overseas call
[00:02:59.00]
A: at Primary school they don't have handphone ah
B: have
[00:03:03.00]
A: there's a programme and the kids have to register with the office. the office knows which ones carry

[00:03:42.00]
C: we have steal handphone. what else can we get?
[00:03:45.00]
B: i let you play basketball then you steal my basketball
[00:03:53.00]
A: i let you copy my homework and when the teacher asks why you have the same you say it was ??? OK
[00:04:09.00]
B: someone helps you with their work
A: you accuse the other person of being the copier
[00:04:16.00]
A: is it us?
B: no
[00:04:53.00]
A: still waiting. OK you help him a lot of times and you steal
B: at school ah
[00:05:14.00]
A: grandparents take care of kids
[00:05:44.00]
C: quick to take issues like pampering the kids
[00:06:01.00]
C: giving sweets
[00:06:21.00]
C: or blaming them when their child is hurt lah
[00:06:41.00]
C: they forget the good very quickly
[00:06:52.00]
A: then the teacher?
[00:06:55.00]
B: parents never appreciate
[00:07:07.00]
A: when do they feed the parents huh?
[00:07:07.00]
B: appreciative
[00:07:22.00]

GROUP POSTS TO iSTORM
[00:07:29.00]
C: breaking bonds ah. very interesting
B: leaving the country after benefitting from it
[00:07:37.00]
C: we really think in Primary school mind
[00:07:59.00]
A: say something more closer like bond or retrenchment
[00:08:06.00]
A: you have a certain obligility to the person
[00:08:10.00]
C: retrenchment. expand on it ah
[00:08:18.00]
C: a bond breaker yeah
[00:08:28.00]
C: there's a lot of scholarships but they don't understand there's only a limited number of scholarships

[00:08:58.00]
READING NEW iSTORM POST
C: who's that?

[00:09:02.00]
A: we've already summarised the meaning right?
B: one example
[00:09:06.00]
C: so which example
A: the first one
[00:09:10.00]

ANOTHER iSTORM POST SUBMITTED
C: oh no

[00:09:24.00]
A: friendship is an example. what else?
[00:09:31.00]
C: working relationship
B: hey remember the insurance theme?
C: yeah. she supposed to give you the benefits then she steal the benefits for herself
[00:09:39.00]
C: so my hand feeds her commission and she takes my gift
[00:10:06.00]
C: a sense of betrayal
A: one word to summarise it
C: betrayal
[00:10:06.00]
C: will they understand that?
A: an explanation ah
[00:10:32.00]
A: becoming a do gooder. the one that help

[00:10:38.00]
READS MESSAGE FROM INSTRUCTOR - 5 MINUTES LEFT

[00:11:06.00]
iSTORM UP FOR GRABS

[00:11:08.00]
C: is it us?
[00:11:26.00]
C: is it OK like that?
B: guess it will do right?
A: give an example
B: example
[00:11:35.00]
C: for example, which is the best one?
[00:11:38.00]
A: the first one ah
C: which is the first one?
[00:11:43.00]
A: quick. phone example
[00:11:50.00]
A: stealing the handphone off the person who lend it

[00:12:16.00]
POSTED TO iSTORM
[00:12:28.00]
A: you can operate ah?

[00:12:32.00]
READING ABOUT THE PARENTS POSTING
[00:12:042.00]
C: we are not visiting them at all
[00:12:52.00]
A: don't care for me. care for you
[00:13:22.00]
C: why are you pinching me for? change
[00:13:32.00]

END
[00:13:37.00]

Appendix 7
Interviews - a sample transcript.

{QTtext}{timeScale:30}

[00:00:00.00]
INTERVIEW POST ACTIVITY 4

[00:00:05.00]
A= Lily
B= Grace
R: Researcher

[00:00:10.00]
R: First of all, can you give me your opinions about
[00:00:13.00]
the kind of activities we've been doing
[00:00:16.00]
using iStorm. Remember the synchronous activities and the one we did today.
[00:00:22.00]
B: I think it helps students to learn collaboratively
[00:00:31.00]
it encourages them to interact socially
[00:00:34.00]
conversing online and helps them exchange ideas
[00:00:47.00]
with other students over distance
[00:00:52.00]
R: working together though. do you think it helps students working together?
[00:00:56.00]
A: Usually when students are sitting around the computer,
[00:00:59.00]
not everyone takes turns
[00:01:03.00]
usually there is one dominant person but
[00:01:10.00]
as we moved on to the next iStorm we gradually begin to take turns
[00:01:17.00]
particularly when the teacher says to take turns.
[00:01:21.00]
The teacher must say to take turns to us the computer
[00:01:26.00]
R: so the teacher is still important in managing and prompting
A: and facilitating
[00:01:41.00]
R: so we can't truly be open along the flexibility continuum
[00:01:44.00]
we have to bring it back a bit and make it flexible but not truly open
[00:01:46.00]
A: the teacher must give some instructions
R: Ok
[00:01:55.00]
B: assuming that the students are able to manage themselves.
[00:02:00.00]
let others have a chance.
[00:02:03.00]
Otherwise one group will dominate and
[00:02:07.00]
refuse to give the button to let others respond

[00:02:11.00]
R: This kind of collaboration is going to be promoted by MOE under MP2.
[00:02:20.00]
You have experienced this now and
[00:02:24.00]
you can see there are some positives but also some negatives
[00:02:28.00]
R: What are the downsides of this,
[00:02:31.00]
what are your negative feelings as a teacher but also as a learner?
[00:02:35.00]
B: the downside is if we have computer problems then the whole lesson will be disrupt
[00:02:43.00]
I suppose the teacher will have to have a back up lesson plan
[00:02:53.00]
or the students wouldn't have anything to do
[00:02:57.00]
R: if you have 3 schools you will need 3 sets of back ups
[00:03:02.00]
B: and what if it's just 2 schools and
[00:03:05.00]
one school has failure performance
[00:03:07.00]
and the other 2 will just be left stranded
[00:03:09.00]
R: Would you agree?
[00:03:11.00]
A: yeah, I'd agree and it could be a problem meeting online
[00:03:21.00]
it could be a problem in reality
[00:03:27.00]
getting permission. is it HOD or one of us?
[00:03:31.00]
R And what we want to do is collaborate with schools overseas.
[00:03:34.00]
And that is even more problematic.
[00:03:38.00]
R: As a teacher obviously you want
[00:03:40.00]
to do these kind of activities to promote learning. Looking at the list of cognitive development, what are the top two or three cognitive outcomes you think iStorm and collaborative learning promote?
[00:04:20.00]
B: I think they PRODUCE NEW IDEAS
A: Also CRITICAL THINKING
R: OK
[00:04:25.00]
B they can develop other people's responses. VIEWPOINTS. Also construct their OWN EXPLANATION.
Hmm
[00:04:44.00]
R So my final questions is having experienced iStorm 4 times plus associated activities with me using Inspiration, sharing across the room with other students. How have you changed?
[00:05:00.00]
Have your beliefs in teaching changed over the past 10 or 11 weeks and, if so, in what ways?

[00:05:16.00]

A Initially I thought iStorm was waste of time. Initially there were technical problems and I questioned the benefits of it but after a number of tries I think it can be useful to ask questions, opportunities for questions I am now comfortable with it and realise we can learn with other students in other schools
[00:05:32.00]
A: I really thought iStorm changed my beliefs. After some practice I think we can try and I think students will feel motivated, get motivated to use iStorm
[00:05:56.00]
R That's good to know.

[00:06:16.00]
THE REMAINDER OF THE INTERVIEW IS THE RESEARCHER ANSWERING QUESTIONS ABOUT THE RESEARCH, COLLABORATION AND SYNCHRONOUS NETWORKING

[00:14:00.00]
END
[00:14:05.00]

Appendix 8
Bulletin Board System (BBS) postings – a sample.

UBB.classic

TOPIC POLL REPLY

» Hello, Michael Vallance [log out]
NIE ELL/AG Bulletin Board » BA/ BEd programme » CAE 442 Computer Applications in Language and Literature (2005) » Chapter 8 Digital Literacy

Michael Vallance

Moderator
Member # 2

posted September 08, 2004 11:00 AM PROFILE WEBSITE EMAIL MESSAGE EDIT QUOTE
Chapter 8 Digital Literacy in Action
Introduction

Quote from a student.
"I just wish that my teachers were less afraid of what we 'could' do and created a chance for us to show what we 'can' do."

Quotes from a teacher.
"Electronic technologies are rarely used as an inquiry tool in schools; they are most often used as electronic worksheets."

"Students were hungry to complete interactive, engaging, tech-infused activities in class and to extend our classroom community beyond the classroom walls."

"So what does it take to be a tech-savvy English teacher? A little vision. A lot of patience. The openness and willingness to take risks."

"As English teachers we never expect students to select a book and work their minds through it without first preparing them with strategies, expectations, and tools for unpacking what they might find. Why is it then that we allow students to access information online without similar tools?"

Kajder, S. (2004) Plugging In: What Technology Brings to the English/ Language Arts Classroom. Voices from the Middle. Vol. 1, No. 3 March 2004.
Available in NIE library

[September 08, 2004, 11:06 AM: Message edited by: Michael Vallance]

Michael Vallance MSc CALL&TESOL, BSc(Hons), PGCE, DipTEFLA
mval@nie.edu.sg

Posts: **344** | From: **3-3-97 School of Arts** | Registered: **Aug 2001** | IP: Logged

Michael Vallance

Moderator
Member # 2

posted September 09, 2004 01:14 PM PROFILE WEBSITE EMAIL MESSAGE EDIT QUOTE
While we await the summary, here is the link to the Word document with digital literacy skills at each Step inserted by YOU.
Go to http://homepage.mac.com/mvallance
Select DOWNLOAD and it's the TaskAns.doc file.

Michael Vallance MSc CALL&TESOL, BSc(Hons), PGCE, DipTEFLA
mval@nie.edu.sg

Posts: **344** | From: **3-3-97 School of Arts** | Registered: **Aug 2001** | IP: Logged

SzeLeng

Junior Member
Member # 539

posted September 09, 2004 02:16 PM PROFILE EMAIL MESSAGE EDIT QUOTE
A summary of today's 2-hr tutorial

1. We were divided into 4 groups (A,B,C,D) and shown a demonstration on using Hot Potatoes. We went through 3 exercises that taught us compound words. The first two were matching exercises, while the third was an exercise using the flashcards to reinforce the lesson.

To extend the lesson: We could create gap-filling exercises using Jcloze and contruct sentences using these new words. (Students can do it as well)

Other possible uses of Hot Potatoes mentioned in class: Teach connectives, matching the topic sentence with the relevant paragraph...

2. We discussed about the uses, benefits and concerns on Hot Potatoes. We tried to answer the question in groups and as a class:
Q: What makes Hot Potatoes hot?
Hot Potatoes can be applied in student's independent learning as well as collaborative learning. The idea is to turn the behaviourist approach into a more communicative one.

3. We then moved on to Ch 8: Digital Literacy in action.
Each group was assigned a 30 min digital literacy task where we had to use 3 different applications, namely, istorm, inspiration and internet. The goal of the task was to construct an essay on the topic 'Mobile Phones cause cancer'.

4. Next, we went on to discuss the skills and strategies required for each step first in our groups and then, as a class.

5. We answered the following questions in class:
In step 6:
How do you develop your pupils' effective searching skills?
How would your students best evaluate websites? (refer to pg. 167-169)
Some responses from the class:
Use of focusing questions, help pupils to locate keywords, identifying and understanding functions of good search engines and teaching them how to skim and scan.

Other questions: How do you reference the sources?
Is this task CRISP?
C lear
R elevant
I nteresting
S hort
P roductive
Where would you fit this task on the flexibility continuum?
Most groups find that the task rests a in scale between 2 to 3. The task is pretty open as autonomy were given to students to negotiate the topic of the essay. However, there were some fixed steps/ structures to follow in the process of the task.

6. We were also introduced to CINCH, strategies that students could use to search and evaluate websites.
C concept mapping
I Identifying search engines
N Narrow your search
C Credibility assessment
H Helpful resources
Note: CINCH is from http://www.tammypayton.net/courses/search/summary.shtml - edited by Michael

Note: Read chapter 9 for next lesson.

To be continued...

[September 14, 2004, 12:05 AM: Message edited by: Michael Vallance]
Posts: **11** | From: **Singapore** | Registered: **Jul 2004** | IP: Logged

HUI MIN
Junior Member
Member # 547

posted September 13, 2004 10:44 PM PROFILE EMAIL MESSAGE EDIT QUOTE
I felt that constructing an essay as as class using IT was indeed very interesting. The thing i like about it best is that it allows students to work in a different environment, yet ensuring that there is the same end result which is the essay.

By working in their small groups first, students are then encouraged to work collaboratively with the rest of their group mates. Ideas are put forth and discussed before the group decides on a particular group consensus.

Once this is done, the idea is then proposed to the other groups and information is shared across the board. Constructing an essay this way sure beats the conventional way of essay writing.

Any thoughts?
Posts: **10** | From: **SINGAPORE** | Registered: **Jul 2004** | IP: Logged

Li Ching

Junior Member
Member # 542

posted September 15, 2004 01:53 PM PROFILE EMAIL MESSAGE EDIT QUOTE
Quote from a student.
"I just wish that my teachers were less afraid of what we 'could' do and created a chance for us to show what we 'can' do."

The above quote struck a chord with me, not in the perspective of the student, but of the teacher's.
The incident happened during my practicum when I was required to bring a P5 class to a computer lab for Mathematics lesson. They were supposed to revise and practice on the topic of Fraction in a CDRom. I have heard many horrible stories of management problems in the lab from other teachers. (i.e. pupils messing with computers, running around in the lab and pulling out cables.) As a result, I became such a control freak. The students wanted to experiment with other topics that were not taught before but i was reluctant to let them. I did not want them to venture into areas which I was unprepared for. Furthermore, I did not trust them to meddle with computers so I decided that they should just follow my instructions and procedures. In the end, the classroom management was all right but I felt that the lesson could have been better if I had allowed more autonomy.
As I recall the incident, I saw myself being guilty of denying my pupils the chance of acquiring hands-on knowledge with IT due to my management fears. Often, we were so focused on making the class quiet and orderly that we forgot that pupils needed the opportunity to explore and learn. I guess as teachers, regardless of what subjects we are teaching, we really need to be more risk taking and trust pupils to do what they 'can' do, and not what we Think they can do.
Posts: **7** | From: **singapore** | Registered: **Jul 2004** | IP: Logged

Michael Vallance

Moderator
Member # 2

posted September 15, 2004 10:27 PM PROFILE WEBSITE EMAIL MESSAGE EDIT QUOTE
Thank you for sharing, Li Ching. Any other personal anectodes will be most welcome so we can all learn from one another's experiences.

Michael Vallance MSc CALL&TESOL, BSc(Hons), PGCE, DipTEFLA
mval@nie.edu.sg

Posts: **344** | From: **3-3-97 School of Arts** | Registered: **Aug 2001** | IP: Logged

Shanthi
Junior Member
Member # 543

posted September 23, 2004 05:55 AM PROFILE MESSAGE EDIT QUOTE
Yes, I agree that it is interesting to use I-storm for composition writing. I personally like to use the tool for pair work in which pupils do process writing. Pupils could copy, paste their final essay in a word document and display their essays. I thought it is a good e-portfolio. Subsequent personal essays could be done in Microsoft word. And the mode of assessment for writing could be changed to portfolio assessment instead of the one time sitting assessment. Of course, the question is reliability would arise. I have yet to fine tune that part. I am just voicing an opinion to hear more suggestions. I was thinking of e-portfolio as it is convinient to store and recycle. The teacher and pupils can have assess to the portfolio at any time and any place. Better still both of them can assess it at the same time. The teacher can mark the e-portfolio even at home without having to carry heavy files home.
Posts: **8** | From: **Singapore** | Registered: **Jul 2004** | IP: Logged

Lakshmi
Junior Member
Member # 550

posted September 23, 2004 09:24 AM PROFILE EMAIL MESSAGE EDIT QUOTE
I agree to the quote that as a teacher you have to be open, patient and be willing to take risks when conduting IT lessons. I experienced that during my practicum. In fact, I got impatient with students raising their hands with problems all the time. Well, I took the risk and was impatient.It definitely was chaotic. When I talked to my CT about it, she said that she never brings her class to the computer knowing how chaotic it can get. She said she was not willing to "take the risk". Even an experience teacher like my CT has this perception of IT based lessons. I guess it's 'forced' upon younger teachers to use IT in our lessons and we use it for the sake of using without considering our roles or the students' roles.
Now I understand the mechanics behind an IT lesson and will use it willingly without being forced into it.

[September 23, 2004, 11:13 AM: Message edited by: Lakshmi]
Posts: **6** | From: **Singapore** | Registered: **Aug 2004** | IP: Logged

SzeLeng

Junior Member
Member # 539

posted September 23, 2004 09:26 AM PROFILE EMAIL MESSAGE EDIT QUOTE
Shanthi, I think your idea's great. Having a e-port folio and port-folio assessment instead of just one test/ exam. Personally, I feel that assessment in languages, should be on-going, rather than just a one-time exam. Fistly, helps the students to look their own progress and reflect. Secondly, caters to those students who are not very good in exams. Somehow or rather, most of us, even the students themselves, seem to think that test results equals to language ability, which is not true. For instance, when I was in secondary 1, I studied in a Malaysian Chinese Private school. The way we learn English then was all by rote-learning, meaning you memorize everythinng about grammar and vocabulary, memory model answers and model compositions. It was easy to score well, hence, giving the students impression that they are doing well. But when it comes to comfortability with the language, it's nearly zero cause we do not really communicate in English.
Posts: **11** | From: **Singapore** | Registered: **Jul 2004** | IP: Logged

Grace

Junior Member
Member # 538

posted September 23, 2004 09:35 AM PROFILE EMAIL MESSAGE EDIT QUOTE
Sometimes the pupiuls become disruptive because of the "technical" problems they face in the lab. They may not be able to handle the computer functions if something slightly different appears on the screen. One teacher in a class of forty and a lesson to teach makes it a daunting task.

I believe that if we can grit our teeth and bring the pupils in several times, they will familiarize themselves with the computer and future lessons will be more manageable
Posts: **9** | From: **Singapore** | Registered: **Jul 2004** | IP: Logged

MARIANNA
Junior Member
Member # 540

posted September 30, 2004 11:48 PM PROFILE EMAIL MESSAGE EDIT QUOTE
Adding on to the thing about assessing through the use of e-portfolio, I think it is a very good idea. However, the problem with Singapore, I feel, is that the traditional method of written exams have been working, and are working very well. Perhaps this is not a problem to some but in my opinion, trying to implement such an innovative way of assessment will be faced with great opposition or lack of interest simply because the traditional methods are still working well. We always say, why change something that is still working, especially if it's working well? This, I think, is an issue that the more traditional teachers will have a problem with, if the e-portfolio, or any IT based assessment, is encouraged or implemented. Hence, perhaps what we really have to do is to show the less IT-savvy or the anti-IT, the value-addedness of using IT in assessment, as what is being discussed in class today.
Posts: **4** | From: **SINGAPORE** | Registered: **Jul 2004** | IP: Logged

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Appendix 9
Competencies – sample of competencies exemplified.

Bulletin Board System (BBS) submissions categorised by competency

Competencies			When said	Comment
Generic	Epistemic	Declarative		
	APPLICA TION	CRITICAL	Post Task 1	I feel that the i-storm programme has its limitations such that students from one group might 'hog' onto the window for too long and others will not have a chance to contribute their work. LI CHING
	VALUES	CRITICAL	Post Task 1	having a chat window is said to provide students with the freedom to negotiate with other groups, but wouldn't negotiation in a face-to-face manner allows even greater freedom for communication and the development for social skills? Are we sometimes guilty of trying to convince ourselves that every software is useful? LI CHING
	VALUES	VIEWPOINT S	Post Task 1	we should not be too quick to embrace everything that has to do with IT but take a step back to evaluate its pros and cons before we incorporate IT into the classrooms. LI CHING
NEW IDEAS	CONNEC TIONS		Post Task 1	I think the common document(the one that can be put up for grabs) could be used to put up consolidated information of a given topic for the chat group. For eg, a few students from Malaysia, Philippines, Thailand, Indonesia and China may be given a topic on their own culture or country to prepare. After which, they can put it up on the common document during the chat. The smaller chat window could be used to ask questions about what has been put up in the common document. After all those clarifications, the common document may be edited along the way to make it clearer, more comprehensive and informative. The finalised copy can be saved and printed out for display and shared in each student's classroom. GRACE CHEW
		CRITICAL	Post Task 1	I do agree that how teachers use IT in their teaching should be the focus. However, my concern is that if technology itself is unpredictable, how then can teacher maximise its usage when it breaks down during critical moments? KWOK HUI MIN
	CONNEC TIONS		Post Task 1	I think that many of these problems that we face when we are out in schools are due to teething problems as IT may not have been actively used by the teachers hence many of the problems remain 'dormant'. SU LIN
	VALUES		Post Task 1	I realize that I fell into the trap of letting technology taking precedence over pedagogy when my supervisor insisted on powerpoint presentation and allowed the lesson to be too teacher-centred. I agree that computers are best-used for inquiring, creating and communicating. The question is then 'How?' and to answer this, we have to not only improve our IT skills but change our mindset on teaching and learning. SZE LENG
CORE	APPLICA	CRITICAL	Post	Putting the technical problems aside, as much as the

SKILLS	TION		Task 1	MOE/schools emphasized that teachers are to make full use of IT, ANOTHER BIG PROBLEM arises! Teachers ourselves are not trained how to use IT! Not only do some teachers themselves are not taught how to make lessons using IT nor are we equipped with the latest information of IT 's capabilities, we are faced with challenges such as making use of IT in our lessons. SO, the question is: "How well can we make a lesson with IT such that students gain/learn something out of it at the end of the lesson?" How can we show/share with students the wonders of IT and teach them if we are ignorant ourselves in the first place? Teachers have to be taught how to make use of IT before they can embark on how to use technology to their own benefit to maximise learning. A teacher has to be learned and confident of using IT to make the lesson a fruitful one for students. So the big mind boggling question here that i am faced with is: "Are we ready?" or "Are we just supposed to do it blindly for the meantime"? ZURA
	APPLICA TION	CRITICAL	Post Task 1	I however, feel that Hot Potatoes (software) activities appear very much like worksheets to me because they are questions which are digitalised. The pupil goes through the questions and gets feedback on the answer very similar to a worksheet on crossword puzzles or match the sentences or fill in the blanks. GRACE CHEW
		UNDERSTA ND	Post Task 1	I feel this is what this module has helped me in; the ability and choice to use IT in an integrative manner when i can and need to. LOSHINI
	VALUES		Post Task 2	Our mindsets about how we usually plan our lesson made it difficult to infuse IT. LI CHING
	APPLICA TION	UNDERSTA ND	Post Task 2	I think to change our mindset and approaching in planning is going to take a very huge and brave step, especially for us new teachers. As Li Ching mentioned before, our group was too focused on the structure of the lesson plan and we got stuck on trying to infuse IT. Eventually, we did change our lesson plan to make it more flexible and student-centred. The transition from a more structured lesson plan to a more flexible one involved the discarding of a lot of security blankets and assumptions on our part. SZE LENG
	APPLICA TION	CRITICAL	Post Task 2	The problem with my group was that we felt so compelled to infuse IT. It was as though we were trying to squeeze it into our lesson plan when we all felt that we would rather have done without it if given the choice. KWOK HUI MIN
		CRITICAL	Post Task 2	I am not against the use of IT. it's just that i feel that it can be pretty much over-rated. Just like how during practicum, we are pressured into 'enhancing 'our lessons with IT to "score" better grades. KWOK HUI MIN
	VALUES	VIEWPOINT	Post	In a way, I feel that it brings home the message that

		S	Task 2	perhaps to be more effective teachers, we have to as mentioned in last week's lesson adopt a different kind of approach in planning out our lessons and be prepared to change our mindsets. This would mean that we have to be prepared to move out of our comfort zone. SU LIN
	APPLICA TION	VIEWPOINT S	Post Tasks 3 & 4	I feel that this course has 'enlightened' me on the methods of teaching that I was accustomed to previously. Teaching style has become less rigid and learning for students is very much self-directed. LI CHING
	APPLICA TION		Post Tasks 3 & 4	Student activities have become more student-centred and collaborative. They are given more freedom to voice out their opinions during the activities. the teacher is very much 'behind the scene' LI CHING
NEW IDEAS	VALUES	UNDERSTA ND	Post Tasks 3 & 4	Undeniably, throughout this course, my opinions about teaching and learning as well as student activities have changed. Teaching students using IT is now embraced as I have discovered many benefits that are linked to it. Student activities no longer have to be done individually as I realised the importance and significance of student activities being collaborative and interactive. For instance, using istorm is an innovative way of enhancing interaction and collaboration amongst the students, even across different institutions. Previously, I do not think that this is possible in reality but now i have come to know that it can be done. =) preciaLILY
	APPLICA TION	UNDERSTA ND	Post Tasks 3 & 4	I have learnt that student activities should be designed in such a way that learning takes place naturally, Students should be able to take charge of their learning. There should be knowledge formation and transformation too. Moreover, the activities should be authentic and interesting. For example, the use of I-storm. Students not only do the task but they have to solve certain problems that they encounter. Hence, students learn problem solving skills, communication skills and social skills on top of academic knowledge. SHANTHI
	VALUES	VIEWPOINT S	Post Tasks 3 & 4	My opinion of teaching has changed from the perception of having to supply or just tell learners with all the necessary information to one where it is more crucial to allow them to construct and negotiate the information on their own. In this way, the learning will be more meaningful to them. SU LIN
	APPLICA TION	VIEWPOINT S	Post Tasks 3 & 4	My opinions of student activities have changed in that I have realised that IT e.g. Inspiration and iStorm can be used to faciliate student centred learning as opposed to only as a source (Internet) where they can search for information. Additionally, the teacher will also have to learn to assume the role of a faciliator as opposed to expecting 'absolute' control. SU LIN
NEW IDEAS	APPLICA TION		Post Tasks 3	i now know that schools can collaborate online real-time to chat and that constitutes as a student activity!

			& 4	with IT, the term 'student activity' deviates from the conventional pen and paper type of group work to something more 'fun' and collaborative. VILAS
	VALUES	UNDERSTAND	Post Tasks 3 & 4	I realise that IT can do a lot more for language learning. That is provided the mind sets of the teachers using the IT changes. They have to find ways in which to use the different software to create opportunities for their students to learn and collaborate with each other. It can be used to bridge learning styles and distances. I could exploit it to support my lesson objectives and not let it dominate and become the focus of the lesson. GRACE CHEW
NEW IDEAS		VIEWPOINTS	Post Tasks 3 & 4	it is easy to allow co-operation between schools like having an online essay writing competition that is on for a long duration to allow inter-school co-operation. LIN LI
	CONNECTIONS	CRITICAL	Post Tasks 3 & 4	During the practicum, the times when the CT brought the students to the computer lab were always chaotic. The teacher would be at the front of the class, trying to get the students attention to give them proper instructions before they start their work, but the students would already be fiddling with the computer, trying to switch them on and logging on itnto their MOre At Once accounts, e-mails, and other internet game sites. Hence, those lessons leave me feeling very skeptical about allowing students to learn by using computers. However, through the introduction of programs like i-storm, Inspiration and Hot Potatoes, and the modelling in class of how student activities could be done when using IT, I realised that it is possible to retain some degree of control over the students' attention. However, issues like the fact that we're adults and the arrangement of the computers are in the way such that group activities can take place more easily (as opposed to ijn schools where the computers are arranged in rows and the labs and there are 40 restless kids), I'm still not too sure that I would be able to manage a class in computer lab and complete all that I want to do in a given amount of time. But I guess this confidence could come only with experience. MARIANNA
	VALUES	VIEWPOINTS	Post Tasks 3 & 4	As for learning, students learn a lot better when they are given the chance to take control of their own learning. This means that students have the autonomy to go about selecting relevant topics and getting the information that that need. Only when this autonomy is given to students will they then learn more. ... I must say that i am getting more impressed with using istorm as a student activity. It is interesting to see how students take charge of their own work and actually get the other groups to respond when they are lagging behind. The teacher does not have to step in and continue get students to contribute. Instead, the other groups take it upon

				themselves to move along the task. KWOK HUI MIN
NEW IDEAS		CRITICAL	Post Tasks 3 & 4	When we first started using istorm, i did not lie the idea of it as i felt that it encouraged certain groups to hog the main window. When that happened, not all the groups would have an equal chance to share their views with the rest of the class. However, as seen in the last two weeks, a little modification by getting groups to take turns has provided excellent results. Groups are more focused in the information that that they put up and they take more time in looking at the postings done by others. Therefore, i guess the onus is on the teacher to ensure that student activities work and when they do not, the teacher will have to take it upon himself/herself to make the necessary adjustments. KWOK HUI MIN
CORE SKILLS	VALUES	CRITICAL	Post Tasks 3 & 4	I've noticed from this module that there are some truly student-centred activities whereas in my other modules, certain activities are only called student-centred (in spirit) but not in reality or execution. i would like to try more student-centred activities in my teaching in the future but i'm not quite sure how best to do it. HISHAM
	CONNEC TIONS	CRITICAL	Post Tasks 3 & 4	IT can enhance the process of teaching and learning if used in an informed way. The roles of the teachers and students also changes in the learning process with the use of IT. Teachers become more of facilitators and students are engaged in independent learning. The learning environment becomes student-centred and students are able to collaborate with each other. An example is the use of i-storm where students are able to come up with a class product by working in a group. Although i-storm may seem impossible in a class of forty. LOSHINI
	CONNEC TIONS	CRITICAL	Post Tasks 3 & 4	when we have to teach pupils who are about to take a high stakes exam, we might feel the need to fill pupils with all the necessary, and more than necessary, information. I personally would not be comfortable with giving pupils the luxury to explore, experiment and discover knowledge for themselves at such instances. We have to take into consideration accountability to parents, Principals and school standards. LOSHINI
	VALUES	UNDERSTA ND	Post Tasks 3 & 4	there are some areas in my pre-held beliefs that changes have to brought about. For example, pupils can be and should be trusted with technology. i have always been wary of allowing pupils to handle equipments that i deemed too advanced or complicated for their handling. I realise now that this belief was held simply because i, personally, found it such and was uncomfortable using them. Thus i was projecting my apprehension of IT onto students. LOSHINI
CORE SKILLS	CONNEC TIONS	UNDERSTA ND	Post Tasks 3	I find that I can now use IT more naturally because I'm beginning to see the IT as an integral part of

			& 4	teaching and learning instead of some added plus or gimmick to impress students. For instance, initially, when I was asked to design an IT lesson, my questions were 'where can I insert Powerpoint, software and other types of IT resources?' but now, the questions I ask most of the time are 'How can I make my lesson better than before and how can the use of IT add value to the lesson?' SZE LENG
CORE SKILLS	VALUES	UNDERSTAND	Post Tasks 3 & 4	We have learnt that IT can be used to facilitate collaboration, negotiation and construction of meaning by the learners. It can also allow for greater student autonomy in learning. This can be accomplished by designing a task that incorporates characteristics of a good language lesson and use of IT that adds value to learning. SHANTHI & SU LIN
	VALUES	UNDERSTAND	Post Tasks 3 & 4	the role of teachers have changed from a 'know-it-all' to a facilitator. Students, on the other hand, are given more autonomy in their learning process. LI CHING
CORE SKILLS	APPLICATION	UNDERSTAND	Post Tasks 3 & 4	the teacher should have clear objectives and learning outcomes set for the IT task before designing a lesson. there must be a valid reason for the inclusion of IT in the lesson (to add value to learning and teaching). IT can be used to foster collaborative learning ie. students can work together using i_storm, Inspiration. however, teachers have to create opportunities for students to use the technology before students can fully tap the benefits of learning using IT. HISHAM
CORE SKILLS	APPLICATION		Post Tasks 3 & 4	The challenges for us teachers are to find ways in which we can justify our work using technology, persevere on when initial setbacks due to technological malfunction happen as well as promote the use of using IT in language teaching and learning when we go out into the teaching world. We can do this with the help of like-minded colleagues as we collaborate to share our IT-based lesson plans, and this will also serves to save time, share resources and decrease workload. preciaLILY
	VALUES		Post Tasks 3 & 4	The truth is that we will face problems along the way of using IT in our teaching, but our mindset should be that of a willingness to take risks and persevere till the end. Like the moral of the story that we come up with: If there is a will, there is a way. preciaLILY

Appendix 10
Researcher's BLOG – sample.

SYNCHRONOUS TASK 3

The trainee teachers have completed another synchronous networking activity. This time they participated in an activity for Primary school children. Essentially, they had to write an explanation and provide a local example of the idiom 'biting the hand that feeds it'. The role play consisted of 15 students in 3 remote locations connected by iStorm thus working collaboratively towards one outcome.

Synchronous Task 3
Comments
Procedure
The trainee teachers have completed another synchronous networking activity. This time they participated in an activity for Primary school children. Essentially, they had to write an explanation and provide a local example of the idiom 'biting the hand that feeds it'. The role play consisted of 15 students in 3 remote locations connected by iStorm thus working collaboratively towards one outcome.

I included the suggestions for effective utilisation and preferences from the trainees provided in the interviews. These were setting strict time limit for use, a clear and obtainable outcome, turn taking rules, and a follow up task for consolidation thus providing an authentic and meaningful purpose.

Good news
The activity itself was a success; as espoused on the class BBS at http://www.ell.nie.edu.sg/forum/non-cgi/ultimatebb.php?ubb=get_topic;f=37;t=000021

What I have learned
The key appears to be pre-synchronous task preparation in terms of learning objective and task process. The Task itself ran smoothly with no technical glitches and students were very comfortable using the interface and the networking. Essentially, they remained focussed upon the Task and not the technology. I have this captured in digital format (i.e. QuickTime).

Interviews
In the follow up interviews it was interesting to listen to trainees express how the use of networking technologies has indeed altered their beliefs. In effect the trainees had been trained in using PowerPoint to a high technical level but have only now begun to realise how teacher centred this can be and how their use of PowerPoint has simply replicated teacher dominated pedagogy. With the synchronous networking, the focus is upon the learners and their communication and collaboration. Though not ground breaking (ACOT research says much the same about use of IT in the mid- 90's), the comments have confirmed that synchronous networking, over time, has a positive impact on pre-service teachers in the development of their thinking about pedagogy.

Surveys
The surveys to date have also provided interesting perspectives on the Activities and perceived Cognitive Outcomes. Briefly, over the past 8 weeks the Teacher surveys and the Students' surveys are beginning to merge. In other words, the students are recognising the classroom acts and learning objectives of the teacher through the use of the IT throughout the lessons. Initially, as the teachers encourage an experiential approach to learning, the trainees were unclear of the acts and objectives they were participating in; as this was a new approach for many though typical of undergraduate study in the West. Now it appears that there is a common understanding (no, not understanding as my colleague Dr. Towndrow questions how one could measure

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understanding- let's say 'appreciation') appreciation of processes and intended learning (objectives).

What next for me?
I will collate all the survey data and then conduct an analysis of Learning; based upon the calculation procedure by Knipe and Lee (2002).

Indeed the 3 synchronous tasks and 3 interviews (with groups of trainees) have led to an iterative approach in each of the Task designs and IT usage. I have one more Task to undertake (next week) followed by one more group interview.

I also must re-ask the initial questions on the BBS in order to collate written evidence of how trainees have changed their beliefs (if at all).

To post to BBS: Having participated in CAE 442, I would like you to briefly answer the following five questions:
1. What, in your humble opinion, is learning?
2. What, in your humble opinion, is an activity?
3. What activities promote learning? In your humble opinion, of course.
4. In what ways has this course changed your beliefs as a teacher?
5. What benefits can a collaborative IT tool like iStorm bring to learners?

The negatives.
Time. I am always rushed to finish course and research even though both are intertwined, integrated, together. The trainees have been very accommodating though.
Language - Singlish. Yes, I must complain. Listening to the trainees working freely on the tasks has been insightful but they do not 'think aloud' very well or talk about what they are doing or wish to do, and they don't use the standard English functions when negotiating (or is one just dominating the group in a dictatorial manner?). This is going to be tough to analyse even though I have spent countless hours transcribing.
Assessment. The impact of this course is often tempered by the (enforced on us!) traditional exam so there are concerns and also the assignments are due this week.

Conclusion
I can't believe I am keeping to my framework (well, Levy's actually) and have accumulated valuable data: surveys, screen and video capture of students undertaking the tasks; and post task interviews. My methodology requires me to collect a rich body of evidence and critically engage the trainees with multiple perspectives. I am still hoping that I have done so because this semester is my final opportunity to collect data in such an orderly yet flexible manner. Gulp again… just as I gulped in my last Blog.

Michael Oct 10, 2004

Appendix 11
Consent form.

RESEARCH CONSENT FORM[1]
This form outlines the purposes of the study and provides a description of your involvement and rights as a participant.

Researcher: MR. MICHAEL VALLANCE, LECTURER, NATIONAL INSTITUTE OF EDUCATION, SINGAPORE
E-MAIL: mval@nie.edu.sg TEL: 6790 3475
ROOM: 3-3-97 HOMEPAGE: http://homepage.mac.com/mvallance/

The purposes of this research are:
1) to fulfill a course requirement for THE DEGREE OF DOCTOR OF EDUCATION (EdD), DURHAM UNIVERSITY, UK.
2) to investigate the impact of teacher training that utilises networking technology.

The researcher does not simply train trainees in ICT competency but, more importantly, continually challenges learners to evaluate and reflect on how they would integrate ICT in an informed manner. It is the researcher's hypothesis that this approach to ICT teacher training, utilising networking tools, is required for effective adoption of ICT.

The methods to be used to collect information for this study are explained below. From this information, I will write a case report.

1) During the study the participants are requested to complete a **weekly survey** which, as well as allowing them to reflect and understand, will also ask them to self categorise the class activities and anticipated cognitive outcomes. The surveys are print-based.
2) On 4 occasions I will **record** 3 students working with IT; I will request participation verbally.
3) I will request **feedback** on the activities and make 'field notes' accordingly.

You are encouraged to ask any questions at any time about the nature of the study and the methods that I am using. Your suggestions and concerns are important to me; please contact me at any time at the address/phone number listed above.

I will use the information from this study to write a case report but please note that **weekly submissions, recordings and discussion points raised are anonymous** ...and will remain so.

Thus, I guarantee that the following conditions will be met:
1) **Your real name will not be used** at any point of information collection, or in the written case report; instead, you and any other person involved in your case will be given pseudonyms that will be used in all verbal and written records and reports.
2) Your participation in this research is **voluntary**; you have the right to withdraw at any point of the study, for any reason, and without any prejudice. However, please note that as the weekly data is cumulative it will not be possible to delete any prior survey submissions.

Thank you for agreeing to participate in this study which will take place from JULY to OCTOBER 2004.

YOUR NAME:
STUDENT ID:
E-MAIL:

---END OF CONSENT FORM

[1] Based upon the Consent Form publicly available and provided by Gary Shank, Qualitative Research for the Human Sciences (http://kerlins.net/bobbi/research/qualresearch/consent.html)

Appendix 12
Course syllabus and synchronous (SYNCH) lesson outlines.

Course Outline

CAE 442 Computer Applications in Language and Literature

Description

This course focuses on the use of Information Technology (IT) in the study, as well as the teaching, of English language and literature. We explore how various themes of language, learning and literature can meet the challenges of the Digital Age.

Objectives

On completion of this course, students should be able to:

- articulate and justify ways in which IT can add value to language and literature learning
- prepare and justify a lesson outline that exploits the strengths of IT to provide meaningful learning experiences for their learners
- explain ethical issues relating to the use of IT in language and literature learning contexts
- make suggestions about how to align the qualities and roles of English language and literature students and teachers with Singapore's IT MasterPlan
- teach digital literacy skills to their students
- critically evaluate digital learning resources

Topics

- the meaning of digital language and literature education
- history of Computer Assisted Language Learning (CALL)
- the qualities and roles of computers, teachers and students in language and literature education
- IT and educational policy-making
- contrarian views of IT in education and their relationship to the objectives of the course
- principles of design and production of digital language and literature learning

materials

- digital literacy issues for language and literature teachers and students
- intellectual property rights in the Digital Age
- language and literature testing and assessment using IT

Reading

Towndrow P A & Vallance M (2004) *Using Information Technology in the Language Classroom (3rd edition),* Singapore: Prentice Hall.

Supplementary reading

Tapscott D (1998) *Growing Up Digital: The Rise of the Net Generation.* New York: McGraw Hill.

Healy J M (1998) *Failure to Connect: How Computers Affect Our Children's Minds - and What We Can Do About It.* New York: Touchstone.

Teaching format

The course comprises of one one-hour tutorial, and one two-hour tutorial per week.

Assessment

There is one assignment (40%) in which students critically explore theoretical and / or practical issues relating to the use of IT in language and literature teaching. There is also an examination (60%). In both forms of assessment, students are required to relate their views to the teaching of English language and literature in Singapore schools.

Coordinators

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Michael Vallance, Block 3 Room 97, tel 6790 3475. email: mval@nie.edu.sg

Weekly plan of course objectives

The following plan was used as a 'guide' for the BA/BEd CAE 442 course ' Computer Applications in Language and Literature'. Its purpose was to identify the anticipated CLASSROOM ACTIVITIES and COGNITIVE OUTCOMES for utilisation of both synchronous and non-synchronous technologies. During the course amendments were made to this plan in order to take into account the iterative task design and comments from the students. This plan though served to ensure that the course aims were met. The participants DID NOT see this personal plan.

Teaching Week	Reference (Towndrow & Vallance, 2004)	Technology and networking activities	Details (Towndrow & Vallance, 2004)	Anticipated CLASSROOM ACTIVITY	Anticipated COGNITIVE OUTCOME
1	Chapter 1 Introductions Chapter 2 The Road Ahead	BBS Word	What do you hope to achieve form this course? What IT in education experience do you have? Share with your colleagues. Task 2 What makes IT suitable for teaching and learning English? Sts work together.	INSTRUCT IT GROUP GUIDE QUESTION EXERCISE	CORE SKILLS OWN EXPLAN CONSOLIDATE NEW IDEAS APPLIC CONN CRITICAL
2 (note that this is Week 1 of research)	Chapter 3 History of CALL	WWW	Task 1	INSTRUCT GROUP EXERCISE PLAN IT PRESENT	TERMS DECISIONS APPLIC CRITICAL UNDERSTAND
3	Chapter 4 Educational Policy	P2P iStorm CHAT File sharing	Role play- justify digital resources in a school. Seek commonalities of edu policies.	INFO QUESTION IT PRESENT	CONSOLIDATE VIEWPOINTS DECISIONS CRITICAL UNDERSTAND
4	Chapter 5 Digital scepticism	Word File sharing	Task 4 Task 5	INSTRUCT READ EXERCISE PLAN IT PRESENT	TERMS CRITICAL OWN EXPLAN VALUES APPLIC CONN
5	Chapter 6 Task design	QuickTime WWW BBB	Open and flexible learning. Task 2 Task 3	INFO EXPLAN NOTES GROUP EXERCISE IT	CRITICAL OWN EXPLAN CORE SKILLS APPLIC

6	Chapter 7 Production of resources Chapter 8 Digital Literacy	WWW Word BBS Inspiration iStorm	Define digital literacy and provide personal examples.	READ GROUP PRESENT REVISE	TERMS VIEWPOINTS CONSOLIDATE OWN EXPLAN DECISIONS VALUES APPLIC
7	Chapter 9 Roles of teachers, students, computers.	Word BBS	Task 2	QUESTION IT PRESENT READ EXERCISE	VIEWPOINTS NEW IDEAS CORE SKILLS APPLIC VALUES UNDERSTAND
8	Chapter 10 IPR	Word Inspiration	Task 2 Task 6	READ EXERCISE GROUPS	VIEWPOINTS VALUES APPLIC
9	Chapter 11 Testing	Word iStorm	Task 1	GROUPS READ PRESENT IT	TERMS VIEWPOINTS CONSOLIDATE DECISIONS VALUES APPLIC
10	Chapter 12 Literature	WWW BBS Inspiration	3.1.5 Task	GROUPS READ EXERCISE IT PRESENT	VIEWPOINTS OWN EXPLAN APPLIC
11	Chapter 13 Young Learners	iStorm BBS Inspiration		GROUPS READ EXERCISE IT	VIEWPOINTS CONSOLIDATE OWN EXPLAN DECISIONS VALUES APPLIC
12	Chapter 14 The New Roads Ahead	BBS Inspiration	4.1 Task	READ PRESENT	VIEWPOINTS NEW IDEAS CORE SKILLS APPLIC VALUES UNDERSTAND

The digital library proposal

Learning path: Problem – Process – Solution – Assessment

Problem

Due to everyone's busy schedule the school's Principal has suggested you all meet online in order to reach a consensus. The Principal would like a one-page report that summarises the main points and offers an agreed recommendation.

Process

To facilitate this request we can use an application that allows users to write on one page 'at the same time' (i.e. synchronously). Follow these steps, along with Michael's guidance.

STEP 1 - You have completed your group discussions and inserted the main ideas and sub-points in INSPIRATION.
Click OUTLINE button and then EDIT—SELECT ALL and EDIT – COPY
You have copied your notes to the Clipboard for later.

Now the collaboration.

Remember—your aim is to write a group report to the Principal. What is the format of a simple report? You need an INTRODUCTION – ARGUMENT FOR (bullet points acceptable) – POINTS AGAINST – RECOMMENDATION – REASON.

→ Also, <u>each group is at a different location</u>: school, office, home, work, library. ←

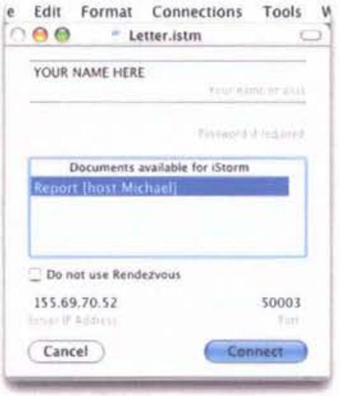
STEP 2 - Open iStorm

Overview

You have a main document frame (on the left): this is where you type the report so keep this text formal. You have a CHAT window (on the right): this is where you can CHAT while another user is typing in the main document. Use the CHAT to, well, chat and debate and reach that consensus.

STEP 3 - *How to connect*

Click CONNECTIONS then CONNECT
You will see this pane



Type your group name
Click Report {host: Michael}
Click CONNECT
(If you do not see {host: Michael} then click the *Do not use Rendezvous* button twice (on and off again)
Click CONNECTIONS once more.
Click REAL TIME (now you see what other people are typing on the document as they type)

STEP 4 - *Typing in the main window*

Read the instructions inside the document pane below.

To insert your text from the clipboard (remember you did this above) simply go to EDIT - PASTE

STEP 5 - Solution

When you believe you have the report ready for the Principal, Group A should go to FILE – EXPORT AS RICH TEXT
Give it a File name (REPORT.rtfd) and SAVE.
That's it – finished.
GROUP A – please drag REPORT file into the iMac's group folder.

STEP 6 – Assessment

Drag the REPORT.rtfd file form the GROUP FOLDER on the iMac to your desktop and open. (DO NOT open within the Group Folder as then no-one else can open the file- you MUST first drag the file to your iMac's desktop)
As English teachers, assess the quality of the final report (language and structure).
Evaluate the process of the activities and possible learning (via the Survey form)

Group A
Your school is considering closing its small library and replacing it with a digital equivalent; a suite of 40 computers, LCD displays, broadband access to MOE resources and the World Wide Web. You are an English teacher and the school's IT Coordinator. You fully support this proposal as many current resources are out of date, etc. Gather and organise your ideas to present your case to the school Principal.

Group B
Your school is considering closing its small library and replacing it with a digital equivalent; a suite of 40 computers, LCD displays, broadband access to MOE resources and the World Wide Web. You are a concerned parent. You agree, in principle, that using IT is good for your child's future but are unsure of its benefits over books, etc. Until there is absolute proof you wish to use the funds to further develop the library or meet some compromise (books and limited IT investment). Gather and organise your ideas to present your case to the school Principal.

Group C
Your school is considering closing its small library and replacing it with a digital equivalent; a suite of 40 computers, LCD displays, broadband access to MOE resources and the World Wide Web. You are an experienced English teacher who is unconvinced by IT in language education and developing life skills such as good communication, etc. You wish to invest the funds in further developing the library. Gather and organise your ideas to present your case to the school Principal.

Group D
Your school is considering closing its small library and replacing it with a digital equivalent; a suite of 40 computers, LCD displays, broadband access to MOE resources and the World Wide Web. You are the IT consultant facilitating this proposal. Obtaining the contract will secure a big bonus. You are convinced that IT is good for the school and the students. Gather and organise your ideas to present your case to the school Principal.

Task: Write an essay based upon ONE of the titles below.
MOBILE PHONES CAUSE CANCER
COSMETICS CAUSE ARTHRITIS
WHAT IS COURAGE?
THE LION KING OR FINDING NEMO?
OUR NEW SCHOOL

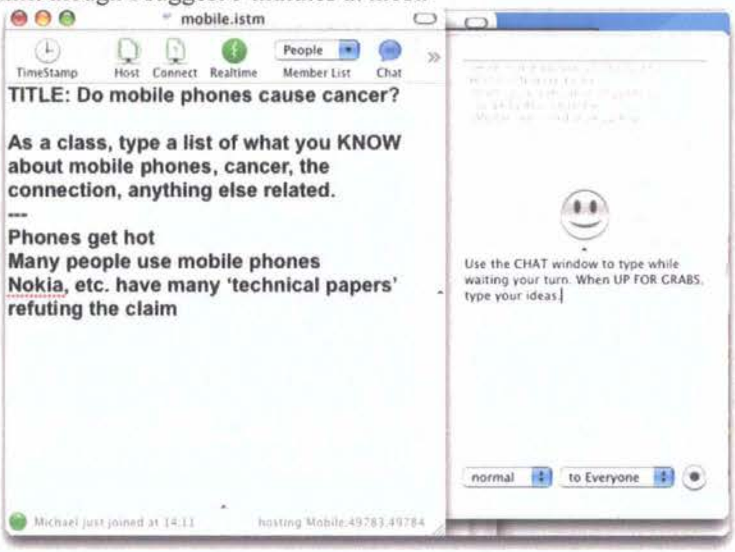
Procedure

STEP 1. Use iStorm to CHAT and negotiate which question to answer. You decide a time limit though I suggest 5 minutes at most.

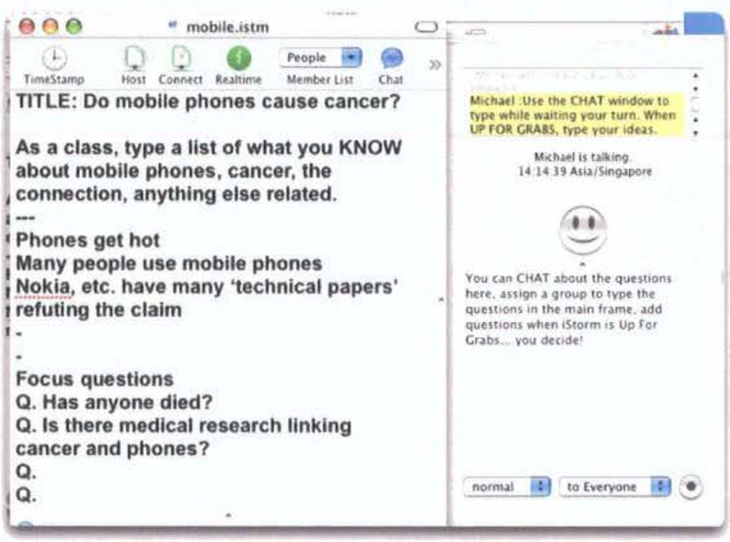
For the remainder of this handout I will use the MOBILE PHONES question for exemplification.

STEP 2. What do you KNOW about the question or the words within the question (mobile phones, cancer)?

Use iStorm to gather information from students around the world (in this case, the group in this classroom). You decide a time limit though I suggest 5 minutes at most.

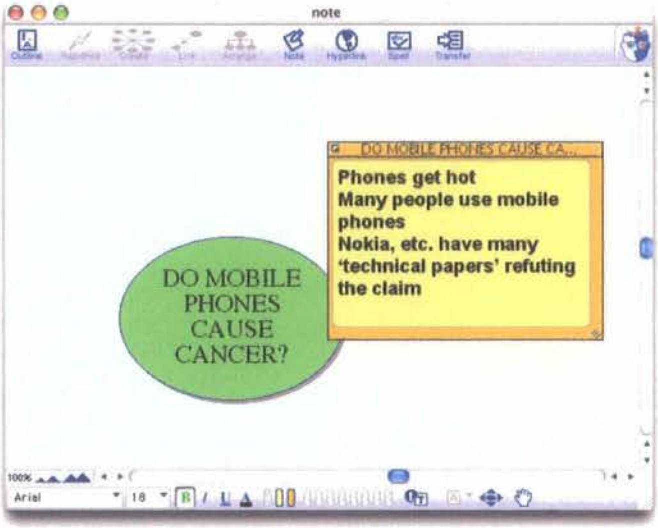


STEP 3. Next, as a group in iStorm, type a number of questions which reflect WHAT you need to know in order to answer the question.

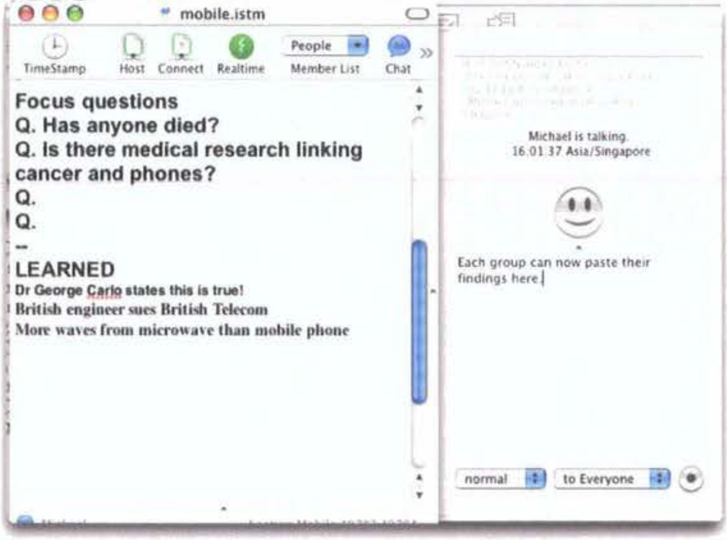


STEP 4. Once you have the list, EDIT- SELECT ALL –COPY. This text is now copied to the clipboard.

STEP 5. In your sub-groups, open INSPIRATION, type the question in the Main Idea node, add a NOTE and then Edit – Paste text.



STEP 6. In your sub-groups, you are now ready to conduct a Web search for your answers.
You are encouraged to use ADVANCED SEARCH at google.com and try to narrow parameters of your searching.
Evaluate the Websites where you have located the information.
STEP 7. In INSPIRATION, create some nodes with answers to the Task questions and link to the Website/s.
Go to Outline and select only this new information.
STEP 8. Return to iStorm to SHARE what you LEARNED with the rest of the class.
Open iStorm and, when ready, paste your text.
You now have a bank of information from which to organise and write your essay.
Feel free to discuss which of these are important for the essay.
When ready, Select All and Copy.



STEP 9. Organising and writing your essay. You have the information; paste it into …
Three options: INSPIRATION templates, create your own organisation map, or use WORD Outline (e.g. INTRO- FOR- AGAINST- SUMMARY- REFRENCES).
STEP 10. Write the essay!

Task: To explain the idiom ***biting the hand that feeds it***	

Scenario. There are 3 Primary schools involved in this collaboration. They are:

1. Basir Ris
2. Hoodlands
3. Boon Way

Together you must explain the idiom **'*biting the hand that feeds it*'** and provide an example with a local (i.e. Singapore) flavour.

For this collaboration we will use iStorm

Use the CHAT window to freely discuss your answers.

Use the main window to post your formal writing.

Rules

- Take turns accessing iStorm. First Basir Ris then Hoodlands then Boon Way then Basir Ris, etc.
- Do not spend too long in the main window so please type in AppleWorks first then copy and paste.

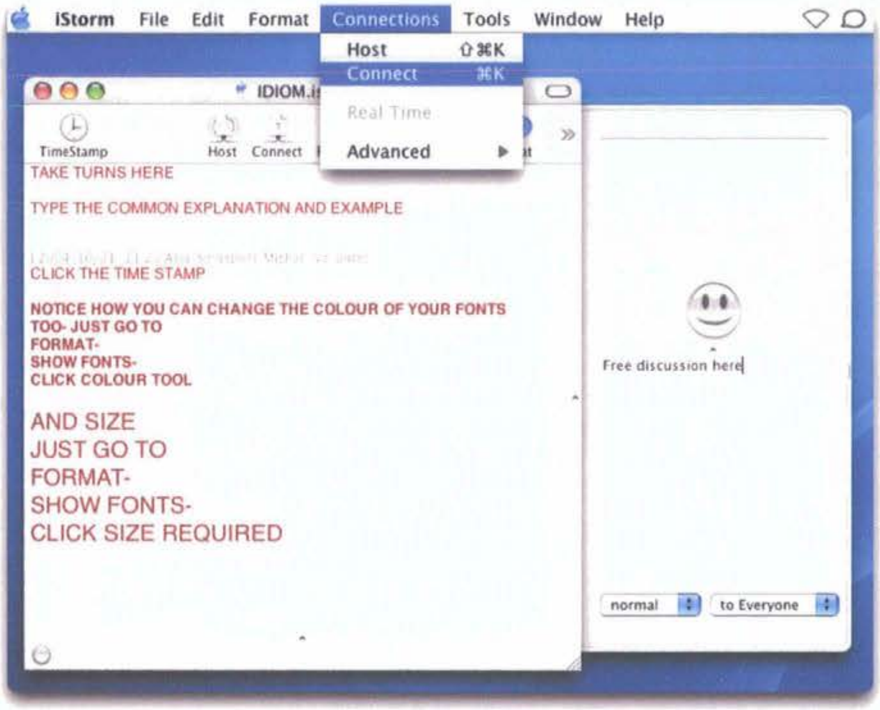
Outcome

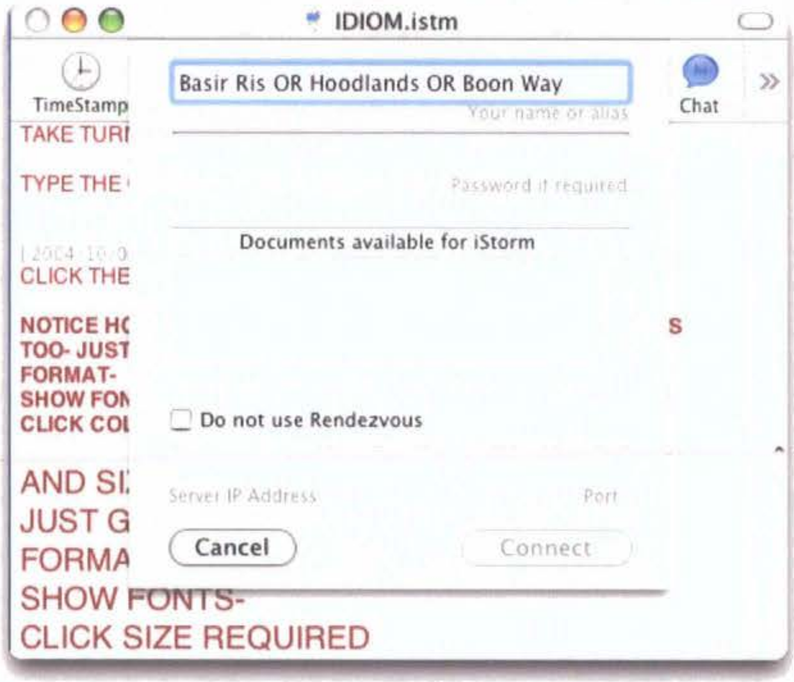
At the end of this collaboration you will have an explanation of the idiom *biting the hand that feeds it* and an example. You will all agree that this is a combined effort from all 3 schools and that the grade will be common for all students (i.e. if it is deemed an A then all schools get an A grade; if F then all get F!)

Procedure

You are all familiar with iStorm so start iStorm.
Go to **CONNECTIONS – CONNECT** and type in your assigned school name.

You can also **customise** the iStorm document window. *See Figures below.*





Note: The inspiration for this task came from IN STEP 5A /EM3 Activity Book Teacher's Edition pages 74 to 77 which is essentially a Reading Comprehension exercise.

Objective: To collaborate on the development of a short story.	

Scenario. There are three (3) Primary schools involved in this story writing. They are:

1. Basir Ris
2. Hoodlands
3. Boon Way

We will use iStorm

Rules

- Take turns accessing iStorm. **First** Basir Ris **then** Hoodlands **then** Boon Way **then** Basir Ris, etc.
- Do not spend too long in the main window so please use the CHAT pane to discuss development

Outcome

At the end of this collaboration you will have a combined story based upon the pictures provided.

Procedure

STEP 1: Start iStorm and CONNECT.
STEP 2: Five (5) pictures will be posted in iStorm by the teacher.
Look at the pictures and discuss the storyline with students from other schools. You can do this in the CHAT pane.
STEP 3: Next, write a sentence (or two) about your assigned picture in the main iStorm window. They are;

- Basir Ris Pictures 1, 4
- Hoodlands Pictures 2, 5
- Boon Way Picture 3, and write a title

STEP 4: Basir Ris to start the story with, ***One very hot and dry summer's day ...***

Note

Ensure that the individual sentences from the different schools link (i.e. are cohesive) and the story makes sense (i.e. is coherent).
Time limited to 30 minutes.

Reflection

See BBS

Pictures and activity are taken from IN STEP Activity Book 1B (exercise 13f), published in 2002.

Appendix 13
Technical specifications and iStorm instructions.

iStorm 3.41

Now Very Internet Friendly.

PDF has a New Friend

Introducing the next generation of collaboration software.

- Built-in web page editing module
- Synchronized PDF Viewer with annotations
- Simultaneous editing in shared scratchpad
- Voice message fellow collaborators
- Snap and send pictures via webcam
- inline TeX and calculator

Introducing iStorm. The world's most innovative collaboration tool, that lets users work, talk, and think together. With iStorm, a user can open up a document, and immediately start brainstorming it with other collaborators over a network.

Sometimes, even a genius needs a prod to make things happen. iStorm incorporates a chatting function, which allows you to argue with peers while editing the document. The chat function also includes a unique emotion system, which allows collaborators to express their emotions while chatting.

iStorm uses the new Rendezvous technology to let users connect to hosts with zero configurations! When a user hosts a document, others on the local area network will see it immediately in the join list without any hassle.

iStorm features an elegant one-button interface that lets users utilize all of iStorm's networked editing functions with a click of a mouse. (Or command + return.) The button doubles as a status indicator of the availability of the document. If it is red, a collaborator is editing the document. If it is blue, you are editing it. If it is green, the document is free for anyone to edit. Could it be more intuitive?

iStorm includes a net-enabled chalkboard. It also features an intelligent yet non-intrusive built-in calculator. Just type a math expression, and a single keystroke will get you the answer. You don't even have to select the expression. For serious scientists, it provides an integrated TeX equation interface which works in the similar way. Synchronized navigation of imported PDF files and shared annotations. Need to work together on a web page? Try our new built-in Web Editor module with amazing steal-and-archive capabilities.History making collaboration is now within a few clicks away.

Latest Version: iStorm 3.41

What's New in iStorm 3.41:

- Several minor bug fixes
- Cartoon caption tool for iChalk
- Seamless collaboration over internet
- Web Editing Module with Steal-and-Archive functions
- Sync PDF with Annotations
- Simultanesous Editing in Shared Scratchpad
- Voice Messages
- Webcam Snapshots

Download iStorm

Purchase iStorm

iStorm used in demo mode has the limitation of a 20 minute collaboration. You can purchase a license to unlock iStorm at the following options:

- Basic License
- Home Site License
- Educational Site License

Buy Now

Collaborate with iStorm- being the HOST

The objective of this collaboration is to simulate distance-based collaboration in the development of an AUP (Acceptable Use Policy). Assume the roles given to you by the instructor.

Follow up questions,

- What benefits and disadvantages did you experience using this collaboration tool?
- How can language teachers take advantage of such a collaboration tool? *Note that Office 2003 is heavily focussed on collaboration. In business it is called Sharepoints but to get it working one needs to activate the Sharepoints service on the Windows server. Such collaboration is common practice at MNC's – USA to Japan to Europe.*

Open **iStorm** and click the **HOST** button (as shown in Figure 1.1).

Type in the document name: AUP (as shown in Figure 1.2)

Type in your assigned vegetable name (as shown in Figure 1.2)

Click Serve

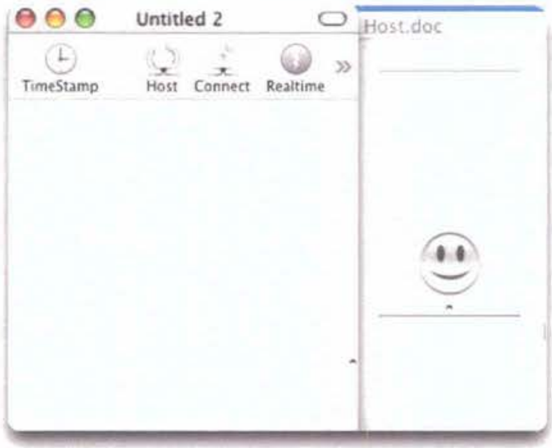


Figure 1.1

Figure 1.2

As shown in Figure 2, the MAIN BOARD is available for you to type your AUP.

The smaller CHAT board is where you can discuss/ chat prior to entering your AUP text onto the Main Board.

Look at the bottom of the Main Board (see Figure 2). You can see a button with your name. This means that YOU are active and have access to the MAIN BOARD.

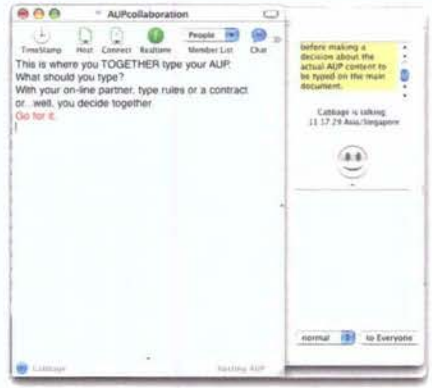


Figure 2 Your iStorm

Look at Figure 3. The button on your collaborator's MAIN BOARD states that it is being modified by YOU. To give them access to the MAIN BOARD simply click that button.

To retrieve access you have to wait until your collaborators click their button to give ownership back to you.

Use the CHAT board freely but seriously develop your AUP.

Figure 3 Your collaborator's iStorm

Collaborate with iStorm

The objective of this collaboration is to simulate distance-based collaboration in the development of an AUP (Acceptable Use Policy). Assume the roles given to you by the instructor.

Use the CHAT board freely but seriously develop your AUP.

Follow up questions,

- What benefits and disadvantages did you experience using this collaboration tool?
- How can language teachers take advantage of such a collaboration tool? *Note that Office 2003 is heavily focussed on collaboration. In business it is called Sharepoints but to get it working one needs to activate the Sharepoints service on the Windows server. Such collaboration is common practice at MNC's – USA to Japan to Europe.*

Open **iStorm** and click the **Connect** button (as shown in Figure 1.1).

Type in the your name (as shown in Figure 1.2)

Click the assigned vegetable name given to you (as shown in Figure 1.2). This means you will be collaborating with users of a similar name (e.g. cabbage).

Click Connect.

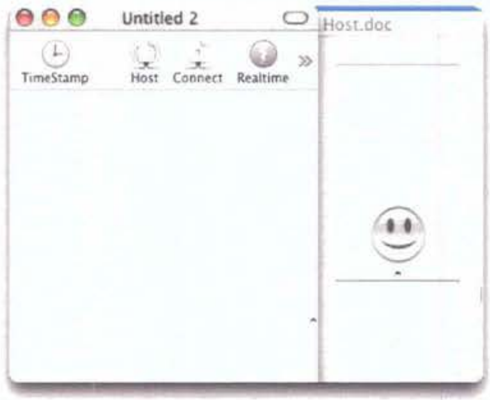


Figure 1.1

Figure 1.2

As shown in Figure 2, the MAIN BOARD, you can see a button with a vegetable name. This means that YOUR collaborators are active and have access to the MAIN BOARD. They are currently typing on the MAIN BOARD.

The smaller CHAT board is where you can discuss/ chat prior to entering your AUP text onto the Main Board.

Figure 2 Your iStorm

Look at Figure 3. The bottom button on your MAIN BOARD states that you have joined. Your collaborators will click their button when ready to give YOU access to the MAIN BOARD.

When given to you, please modify and develop the AUP. Your collaborators will see what you are typing. To give them access to the MAIN BOARD simply click the button.

To retrieve access you have to wait until your collaborators click their button to give ownership back to you.

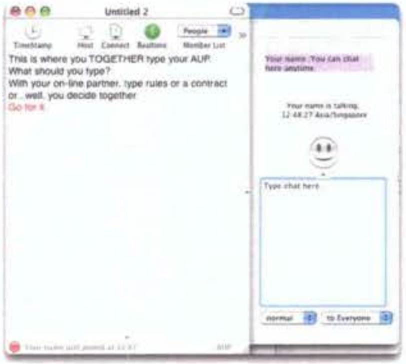


Figure 3 Your collaborator's iStorm

QuickTime Player | QuickTime Pro | MPEG-2 Playback | Broadcaster | Streaming Server

QuickTime Broadcaster

Broadcasting the digital media standard.

Tech Specs | Technologies | Resources | Tutorials | FAQ

Combining the power of QuickTime with Apple's ease of use, QuickTime Broadcaster allows just about anyone to produce a live broadcast event. From a backyard birthday party to a corporate keynote speech, QuickTime Broadcaster allows anyone with an Internet connection to "virtually" attend.

QuickTime Broadcaster is Apple's award-winning live encoding software that lets you produce professional-quality live events for online delivery—quickly, easily and affordably.

QuickTime Broadcaster takes full advantage of QuickTime, the most powerful digital media technology on the Internet. The combination QuickTime Broadcaster, QuickTime Streaming Server and QuickTime provides the industry's first end-to-end MPEG-4-based Internet broadcasting system, which allows you to reach not only the large and growing base of QuickTime Players, but also any ISO-compliant MPEG-4 player. Whether you are a novice or a professional, QuickTime Broadcaster is designed to meet your needs.

What's New in QuickTime Broadcaster

- **H.264 live broadcasting:** When combined with QuickTime 7, QuickTime Broadcaster supports broadcasting in the new H.264 video codec delivering stunning quality live streams at remarkably low data rates with H.264 video.
- **Dramatically increased performance:** Broadcast in full, 640 x 480, 30 fps video with QuickTime Broadcaster to deliver your audience a TV-like experience on their Mac or Windows PC(1).
- **Increased support for 3G streaming:** QuickTime Broadcaster includes enhanced support for live streaming to mobile devices that support the 3GPP standard.

Download Now

Download QuickTime Broadcaster today and sign up for Apple newsletters.

☑ **QuickTime News.** Receive via email a biweekly newsletter highlighting QuickTime technology, new music, movies, video games, DVD releases and more.

☑ **Apple eNews.** Send me Apple eNews, a free email newsletter that contains information about Apple products, special offers, and news about Apple.

Email Address:

Download Now

System Requirements

- Mac OSX/Server v10.3.9
- PowerPC G3 or later (G5 recommended for H.264 broadcasting)
- 128MB of RAM (512MB recommended for professional broadcasting)
- QuickTime 7 or later
- 1.0 MB Free disk space
- Languages: QuickTime Broadcaster includes support for English, French, German, and Japanese.

Other Features of QuickTime Broadcaster

- **MPEG-4:** QuickTime Broadcaster delivers ISO-compliant audio and video. Any MPEG-4 compliant player can receive your broadcast event—making it the perfect way to reach large numbers of viewers for corporate meetings, online courses, keynote addresses, entertainment and other special events.
- **3GPP:** QuickTime Broadcaster can also deliver 3GPP-compliant streams over the Internet.
- **Instant VOD:** In addition to recording your broadcast to disk, QuickTime Broadcaster can automatically hint the file for immediate posting to a streaming server for on-demand viewing after the event has occurred—just what you need for quick video-on-demand posting.
- **Integration with QuickTime Streaming Server:** Delivering your event to a large audience is as simple as clicking a button thanks to integration with QuickTime Streaming Server and Darwin Streaming Server. This integration also provides industrial-strength streaming of your broadcast via Skip Protection, Apple's patent-pending technology for preventing interruptions (or "skips") in the transmission of streaming media.
- **User-friendly interface:** QuickTime Broadcaster provides a basic view that includes presets for popular broadcasting configurations, making it easy to start broadcasting in just a few clicks. Or you can customize your own settings in the expanded view and then save and share them with others.
- **Standards-based delivery:** QuickTime Broadcaster supports both multicast and unicast via the RTP/RTSP transport for delivering live broadcasts.
- **Real-time Statistics:** QuickTime Broadcaster automatically gives you statistics to help manage your broadcast, including the data rate of the audio and video stream, video frame rate, processor load, number of connected users and total data rate of the broadcast.
- **Codec Flexibility:** In addition to H.264 and MPEG-4, QuickTime Broadcaster supports other QuickTime codecs capable of streaming and real-time compression, including those in the QuickTime Component Download Program.
- **FireWire Capture:** QuickTime Broadcaster supports video capture from most FireWire-equipped sources, including DV cameras, some webcams and DV converter boxes for a fast and easy broadcasting process with professional-quality results.
- **AppleScript Support:** Automate broadcast processes such as starting and stopping a broadcast; selecting audio, video and network presets; and checking the status of a broadcast. Frequent broadcast producers can benefit from the automation power of AppleScript.

(1) H.264 compatible player needed for PCs to receive an H.264 broadcast, QuickTime 7 for Windows coming soon.

More Information

- QuickTime Users List
- QuickTime Streaming Server User List

(for server discussions only)

Help

- Technical Support

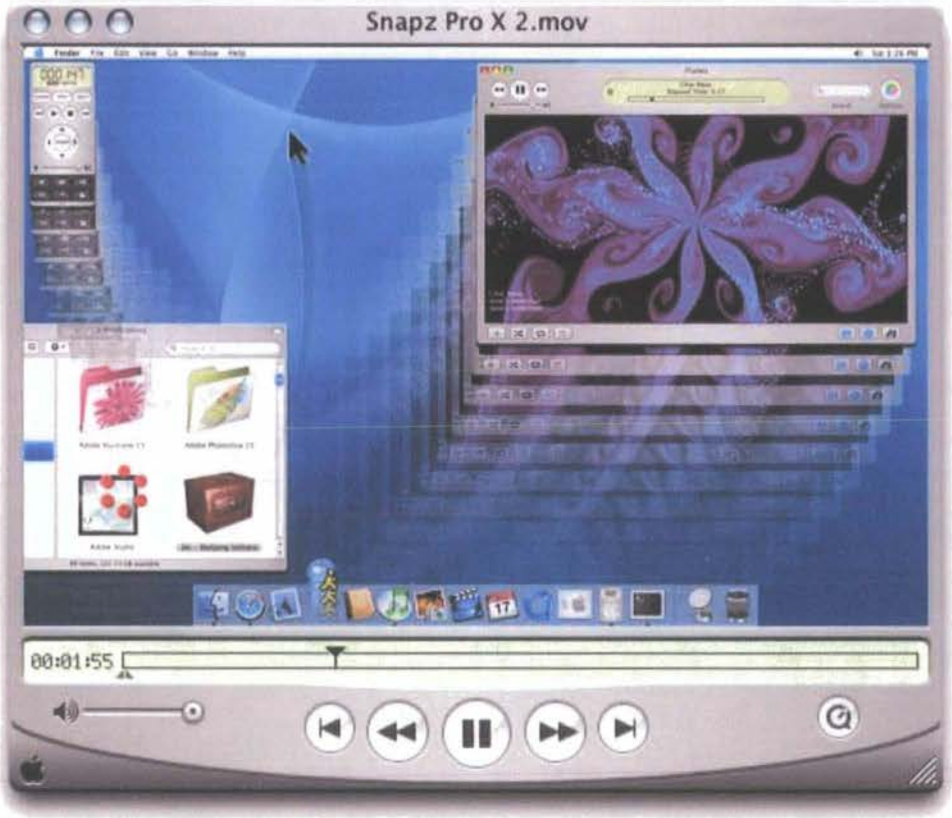
Contact QuickTime

Have a comment about QuickTime? We welcome your feedback.

News | Store | Games | Utilities | Support

Main | Freebies | Snapz Pro X

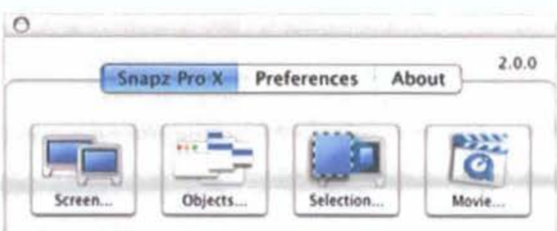
If a picture is worth a thousand words, imagine how priceless a movie would be...



***New in Snapz Pro X 2.0.2:** MacOS X 10.4 ("Tiger") compatibility, bug fixes, hardware acceleration, and more!*


Tiger compatible

Snapz Pro X 2 allows you to effortlessly record anything on your screen, saving it as a QuickTime® movie or screenshot that can be emailed, put up on the web, or passed around however you please. Snapz Pro X 2.0 costs $69. Upgrades from Snapz Pro X 1.0 w/ movie capture are $20.



Why take a static screenshot when Snapz Pro X 2 makes creating a movie just as easy? Snapz Pro X 2 does that, and so much more -- what a difference a

Options

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Newswire
Web Board
Add-On Files
Web Links
Chronicles

In Brief


Snapz Pro X

Version: 2.0.2
Genre: Screen Capture
Price: $29.00 / $69.00
Requires: MacOS X 10.2 or later
Extras: QuickTime movie capture

Summary: Snapz Pro X is by far the most powerful, versatile, and easy to use screen capture solution for Mac OS X. Whether you're writing online manuals that require visual examples, or simply recording video of your flight simulator dogfighting skills, Snapz Pro X is the ultimate utility for capturing moving or still version makes! Download a free demo version from our web site today or check out the demo movies we've created and see for yourself.

pictures on Mac OS X.

Snapz Pro X is a quantum leap in video capture technology, adroitly capturing full motion video of anything on your screen at a blistering pace, complete with digital audio, and an optional microphone voiceover. Think of it as a digital video camera for your screen. Snapz Pro X makes short work of making training videos, producing product demos, creating tutorials, archiving streaming video, and anything else you can think of.

Find out why companies like Apple Computer, Inc., Adobe Systems Inc., Macromedia, Inc., and countless others rely on Snapz Pro X 2.0 when they need to convey an idea effectively. Find out why average users are taking full motion video screen captures rather than the static screenshots of old. Join the video capture revolution.

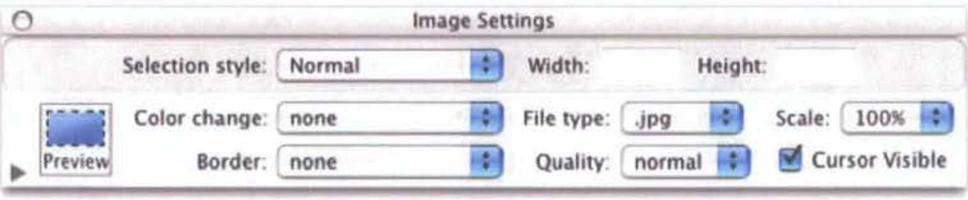
Other Utilites

iSeek

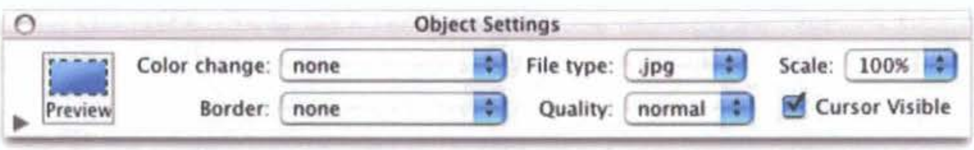
Snapz Pro 2 Classic

ColorSwitch Pro

In addition to a video capture engine that is 20x faster than anything else on the market, Snapz Pro X 2.0 boasts dozens of other new features that you'll quickly wonder how you lived without. We did not follow the industry trend of bloated software with extraneous features; instead we rethought the product.



Snapz Pro X 2.0's interface has been completely redesigned to provide more powerful features while maintaining Snapz Pro X's elegant simplicity. Rather than just tossing new features into an already full-featured product, we carefully examined how people use Snapz Pro X, and developed a new user interface that adds functionality without adding complexity



For those who need static screen captures for manuals, web sites, etc., Snapz Pro X 2.0 offers many improvements. One of the most useful is "Live Preview" which shows you exactly how your screenshot will look before you save it to disk. This allows you to change border styles, scaling, cropping, and other settings on the fly. Instead of guessing what your screenshots will look like, you can get them right the first time.

Snapz Pro X supports saving screenshots as .bmp, .pict, .gif, .jpg, .png, .tiff, .pdf, or Photoshop files, with precise control over image compression. Screenshots can be scaled, cropped, color depth-changed, and dithered. Snapz Pro X can also add borders, generate automatic thumbnails, overlay watermarks/copyright notices... you name it, we got it!

15" iMac G4/700, 800

Details

- introduced 2002.01.07 at US$1,299 (700 MHz, CD-RW), $1,499 (700 MHz, Combo), and $1,799 (800 MHz, SuperDrive); discontinued 2003.02.04; replaced by a single 800 MHz 15" model
- requires Mac OS 9.2.2 or later, OS X 10.1.2 or later
- CPU: 700/800 MHz G4
- bus: 100 MHz
- performance: unknown
- RAM: 128/256 MB, expandable to 1,024 MB using one user accessible 144-pin PC133 SODIMM (up to 512 MB) and one 168-pin PC133 SODIMM (also up to 512 MB) inside the computer.
- Graphics: nVidia GeForce2 MX with AGP 2X support
- VRAM: 32 MB
- monitor: 15" 1024 x 768 flat panel display
- L2 cache: 256 KB on-chip cache running at full CPU speed
- hard drive: 40/60 GB Ultra ATA drive
- CD-RW (24/10/32x), Combo drive (12/8/32x), or SuperDrive (8/8/24x)
- USB: 3 ports
- FireWire: 2 ports
- integrated 56 kbps modem supports v.90 standard
- 10/100Base-T ethernet connector
- AirPort: optional
- Microphone: internal
- power: 130W
- height: 12.95-20.0 in/32.9-50.9 cm
- width: 15.1 in/38.3 cm
- depth: 10.6-16.3 in/27.0-41.5 cm
- weight: 21.3 lb/9.7 kg

iSight

The eyes and ears of iChat AV

iSight is a state-of-the-art video camera that's the easiest way to video conference with your colleagues, friends and family over broadband. Featuring an autofocusing autoexposure F/2.8 lens which captures high-quality pictures even in low lighting, iSight also includes a dual-element microphone in its stylish compact aluminum body.

Like no other camera

Apple brings award-winning product design to iSight — and it's like no other camera available today. A versatile, durable, lightweight and portable camera capable of delivering high-quality audio and video, iSight features a strong aluminum-alloy exterior which protects sophisticated electronics and its autofocus lens. A single FireWire cable streams video and audio and also delivers power to the camera.

Screen-top

iSight sits directly in front of you at eye level.

Other cameras are made to sit off-center on your desk.

Four stands and a tilt-and-swivel mechanism allow iSight to capture video at the best possible angle. While traditional web cameras sit off-center on your desk, capturing the side of your head iSight sits directly in front of you, at eye level. This provides a more natural, life-like conversation and a more familiar TV-like viewing angle. Its compact size makes it easy to take with you anywhere.

Crystal clear sound

iSight includes a built-in, dual element noise-suppressing microphone that delivers crystal clear audio. The microphone takes in the sound from both microphone elements, then determines which sounds are

buy now

The Apple Store offers convenient online ordering 24 hours a day, every day.

Get iSight 1.0.3 Update
You'll enjoy improved iSight audio performance after you download and install the iSight 1.0.3 Update.

Made for iChat AV
As soon as you connect the camera to the computer and turn it on, iChat AV begins working with the camera. There are no additional drivers to install, no software to configure and no tedious set-up "wizards" standing between you and your first video chat. That means you'll have your first video chat in seconds, rather than minutes or hours. iChat AV automatically detects iSight and connects with it. Simply open the iSight lens cap and iChat AV automatically launches and lets your buddies know that you are available for video and audio chatting. (Requires Mac OS X Panther 10.3 or later.)

See iSight in action
Take it for a spin: see a QuickTime VR.

See how it moves
Interact with a QuickTime VR.

Reaction
"Opens up personal communication in whole new ways"
— Popular Mechanics
More reaction...

Featherweight champ

iSight weighs in at a mere 2.3 ounces (63.8 grams) making it easy to carry in your pocket or bag for use essential to the conversation with an algorithm that filters out extraneous noise.

You'll look marvelous

But iSight doesn't just look good, it makes you look good, with the highest quality video of any chatting solution. A custom-designed, three-part lens consists of two aspherical elements that focus on a 1/4-inch CCD sensor with 640x480 (VGA) resolution. The camera's lens aperture is a wide F/2.8, allowing it to collect more light than most web cams. iSight also offers a far wider range of shutter speeds than most other cameras. Put it all together and iSight delivers smooth, top-quality, full-motion video at 30 frames per second in 24-bit color.

The result is that whether it's in a poorly lit hotel room or a bright sunny kitchen, iSight will provide true color reproduction and a crisp image. The camera also sports a small green "on air" light that lets you know that you are participating in a live video chat session. One simple twist of the lens cap turns off iSight, ensuring your privacy and letting your buddies know you're no longer available for video and audio chatting.

iSight Technical Specifications	
Requirements	Requires iChat AV Software (not included), Mac OS X v.10.2.5 or later, 600MHz G3 processor or higher, Broadband Internet connection.
Sensor	1/4-inch color CCD image sensor, 640x480 VGA resolution
Focus	Autofocus from 50mm to Infinity
Framerate	Full motion video at up to 30 frames per second (FPS)*
Input and Output	FireWire for audio, video and power connection
Audio	Integrated, dual-element microphone with noise suppression
Included Accessories	Four camera stands, carrying case, FireWire cable, FireWire cable adapter

*Performance may vary depending on Internet connection speed

anywhere. For convenience and protection, iSight also includes a travel case so you can take it along on trips short or long.

Focus on you

iSight's lens can autofocus as close as 50 mm (2 inches) or infinitely far, so whenever you're in front of your camera, your image is always sharp and clear. iSight also includes an on-board processor that automatically adjusts white balance, sharpness, color, focus and exposure and filters out noise to ensure that the transmitted picture is bright and focused and color is true in any light conditions.

It's a snap

Use iSight to take your own buddy photo. Or two or three. It's easy to show off your latest look to all your buddies.

Just a sec

iChat AV lets you mute the audio while continuing to shoot video, in case you need to have a private conversation in person while keeping a chat open.

Video muting, too

Need a moment offscreen to touch up your hairdo or prepare a surprise? Closing the lens cover mutes the video but doesn't disconnect you from your conversation. To resume visual contact, just reopen the lens.

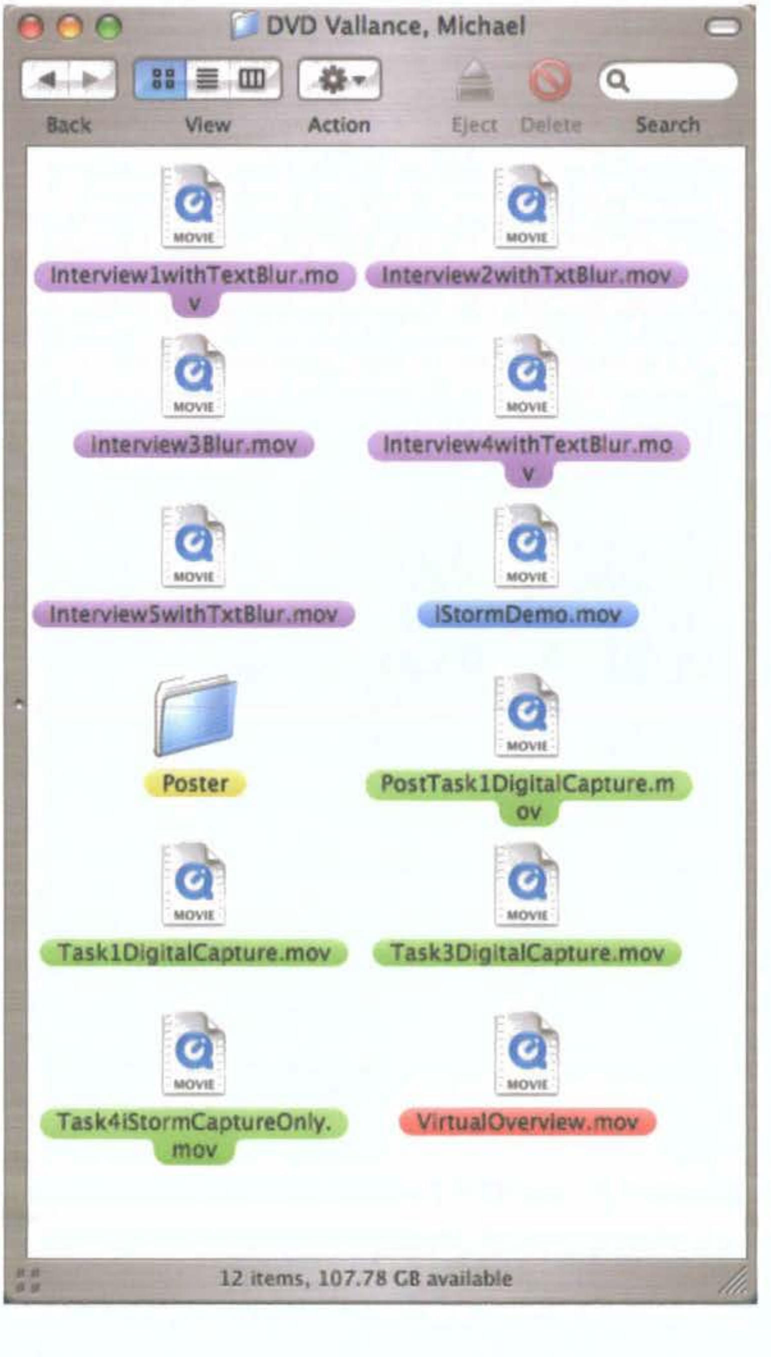
Home > Hardware> iSight

Search

Site Map | Search Tips

Appendix 14
DVD containing demonstrations of the digital capture of data.

Much of the data for this thesis was digitally captured. This DVD includes samples of the captured data together with a demonstration of the technology utilised. This DVD is operational on computers with Apple OS X 10.4 or Windows XP. The digital movie files herein must be viewed using the free QuickTime 7 player (available for download from http://www/apple.com/quicktime). The contents of this DVD are displayed below.



Appendix 15
Illustrative poster representation of the Case Study research.